East End Library

DEC 10 1923

INDEX NUMBER

Vol. 21. No. 12 DECEMBER, 1923

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Entered as second class matter February 10, 1903, at the post office at New York under the Act of 1879.

A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

SUBSCRIPTION PRICE PER YEAR, UNITED STATES AND CANADA, ONE DOLLAR; OTHER COUNTRIES, TWO DOLLARS. THE METAL INDUSTRY PUBLISHING COMPANY, 99 JOHN STREET, NEW YORK, U. S. A.

BIAS BUFFS ARE *MONEY SAVERS*

DOLLAR FOR DOLLAR BIAS DOES 75% MORE WORK THAN LOOSE-LEAF
Wheel for Wheel Bias does Twice the Work of Loose-Leaf
TIME IS MONEY. CHANGE BIAS LESS OFTEN
THAN LOOSE-LEAF
Cuts Tripoli Costs in Half
Because
ALL the Threads are Working all the Time

These prices are in lots of one thousand or more.

PRICES ON LOOSE BUFFS. GOOD FOR 15 DAYS AFTER DATE OF THIS ISSUE

10-in. 18 ply 64-68-350	$24.63	10-in. 18 ply 80-80-4 yd.	$25.26	10-in. 18 ply 80-92-350	$25.26	10-in. 18 ply 84-92-320	$25.57
12 " " " " "	31.95	12 " " " " "	35.10	12 " " " " "	35.11	12 " " " " "	34.96
14 " " " " "	42.32	14 " " " " "	47.06	14 " " " " "	47.06	14 " " " " "	47.65
16 " " " " "	54.30	16 " " " " "	59.48	16 " " " " "	59.46	16 " " " " "	60.22

The BIAS BUFF AND WHEEL CO. Inc.

Telephone Longacre 9755

8 WEST 40th STREET
NEW YORK, N. Y.

A. R. Montgomery
Sales Manager

Contents Page 491

Lacquering — *an art that was never lost*

Courtesy of the Metropolitan Museum of Art

Forty centuries ago—

—sorrowful hands fashioned the mummy case for Meritre, lady-in-waiting at the court of the Egyptian Monarch Neferhotep. Sorrowful hands, with infinite skill, carved the lid of this mummy case, and applied the lacquer.

And now—four thousand years later—the memory of the Lady Meritre has been lost beyond recall—*but the lacquer on her mummy-case is still bright*, despite the fact that her tomb was in a state of extreme ruin.

The lacquers used by the ancient Egyptians were limited, in their application, to certain surfaces. Our problem has been to develop lacquers suitable for practically all surfaces, and to maintain their durability. Only years of laboratory experiment have enabled "EGYPTIAN LACQUERS" to meet these conditions.

Give your product *lasting* beauty. Use EGYPTIAN LACQUERS. We stand ready to advise you.

Our booklet, "Four Thousand Years Ago," will interest every Manufacturer. A postal will bring your copy.

The Egyptian Lacquer Mfg. Co.
5 East 40th Street
New York City

CHICAGO LOS ANGELES SAN FRANCISCO

EGYPTIAN LACQUERS

THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

VOL. 21 NEW YORK, DECEMBER, 1923 No. 12

The Aeromarine All-Metal Hull Flying Boat

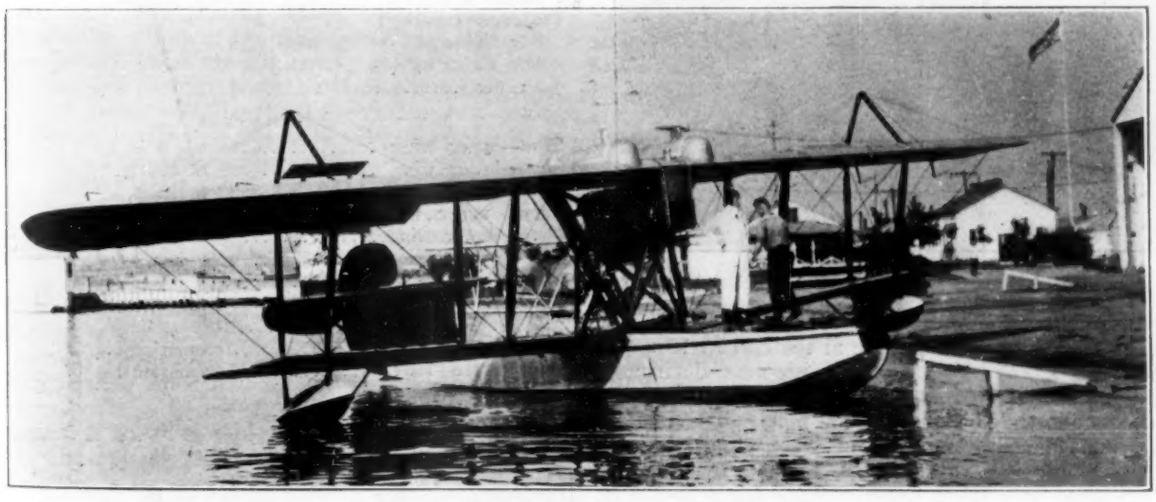
A Description of the Latest Development in Aircraft Construction. All-Metal Flying Boat Made Possible by Aluminum

Written for The Metal Industry by PAUL G. ZIMMERMAN, Chief Airplane Engineer, Aeromarine Plane & Motor Company, Inc.

After three years of commercial flying boat operation by the Aeromarine Airways, it was determined that the reconstruction war-time wooden hull flying boat would have to be superseded by some new type of craft, if such operations were to be successfully continued in the future. It was also realized that it would take some two or three years to design, construct and develop a suitable craft for this purpose.

Therefore, in the spring of 1922 the Aeromarine Engineers began the design of a purely commercial flying boat constructed around the now famous Liberty engine. The great problem before them seemed that of a permanent hull structure which would not water soak. Metal was the only solution. Tests had been continued over a period of two years on the various physical properties of the different aluminum alloys. It was finally determined that 17S alloy* possessed most of the qualities needed for such construction and furthermore was obtainable in quantities in this country from the Aluminum Company of America. Accordingly a design was laid out using sheet 17S alloy for the complete hull structure.

The problem of duralumin aircraft construction had been approached in various ways by different European and American constructors with more or less success. It seemed to the Aeromarine Engineers after studying the situation that the mistake most generally made was that of using too thin metal, yet the machines designed with this thin metal were always comparatively heavy. Upon further analyzing the situation, it was decided that the reason for this was the fact that the skin or plating was used for covering only and in most cases was not employed as a strength member.



AEROMARINE ALL-METAL HULL FLYING BOAT

It was determined in the Aeromarine hull construction to use a thick enough skin so that it would not be easily damaged and to make this skin take the loads imposed upon the structure, the interior bracing or frames and longitudinals being used as stiffening members only to carry the loads to the skin. Accordingly in the hull proper it was decided not to use any metal thinner than .040.

A mistake also found in other structures was the em-

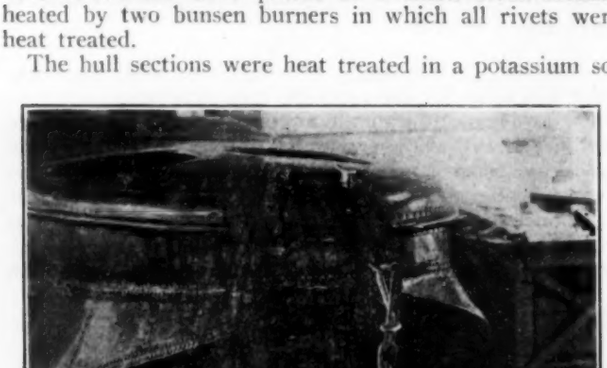
*The 17S alloy is similar to duralumin: Copper, 3.5-5.5; Manganese, .5-.8; Magnesium, .5-.75; iron, .67; Silicon, .33; Aluminum, balance.

ployment of too many different kinds of sections. Hence, in starting the design it was decided to use one "U" section only and to use this for every purpose possible. Finally, however, a second but larger "U" section was found necessary for the keel, otherwise the standardization of the "U" section was carried throughout the hull. This is clearly shown in the various photographs of the frames and bulkheads accompanying this article.

To the surprise of all concerned, it was discovered that the assembled figures indicated a structural weight lighter by 100 pounds than the weight of a similar wooden hull. This weight was realized in the complete hull, although it was made to accommodate seven passengers in addition to the pilot and mechanic, while the wooden hull mentioned would only accommodate four passengers, pilot and mechanic.

The problem of water tightness was overcome by the use of canton flannel and asphaltum interposed between the thicknesses of metal. This made the riveting very difficult, but finally the men became so experienced in driving the rivets that two men could drive one thousand rivets in a day; incidentally there were forty odd thousand rivets in the hull. All 17S alloy rivets had to be heat treated within one hour of the time they were used. This necessitated the development of a small rivet furnace heated by two bunsen burners in which all rivets were heat treated.

The hull sections were heat treated in a potassium so-



BOW OF THE ALL-METAL HULL

dium nitrate bath before and after being formed. Care was taken that the bath should be at the correct temperature, between 920 and 940 degrees Fahrenheit, during the immersion which lasted from fifteen to thirty minutes, depending upon the thickness of the material. After removal from this bath the sections were dipped in cold water and thoroughly washed. It was found that the material remained in a fairly annealed state for a period of thirty to forty minutes after which time it began to harden and a limit of one hour was established as the time in which the material should be worked after its removal from the bath.

The wing tip pontoons were constructed of sheet 17S alloy as was also the framework of the tail plane surfaces which were lighter and very much stiffer than similar surfaces constructed of wood.

The wings and aileron controls were of the standard built up wooden construction. All these were covered with airplane cotton, doped with plain and pigmented dope and finally coated with Valspar varnish.

The Aeromarine Model A. M. C. All Metal Hull Flying Boat, as this machine was named, was launched on June 1st and from the first day of its launching was successful. It remained anchored in the bay between flights from June 1st until August 7th and did not leak a drop of water during that time nor has it since. It has never caused us any trouble from water soakage or leakage, two of the main difficulties with the wooden type of hull and even though some trouble has been experienced with making the paint stick to the bottom there have been no indications of corrosion, excepting in the case of some 140 rivets of the 40,000. These were evidently not 17S alloy as the rivets alongside of them did not show the least signs of corrosion and those mentioned were corroded so as to necessitate their removal.

METAL FRAME FOR HULL

The specifications of the A. M. C. Flying Boat follow:

GENERAL

Type	Flying Boat, Biplane
Purpose	Commercial, Passenger Carrier
Number in crew	Two (2)
Passenger capacity:	
For flights of 7 hr. duration	5
For flights of 4 hr. duration or under	7

DIMENSIONS

Span—upper wing	65 ft. 0 in.
Span—lower wing	48 ft. 6½ in.
Length—overall	32 ft. 10 in.
Chord, upper wing	7 ft. 0 in.
Chord, lower wing	5 ft. 1 in.
Angle of incidence, both wings	4½ degrees
Dihedral—lower wing	3
Dihedral—upper wing	None
Sweepback	None
Wing curve—upper	Aeromarine No. 2
Wing curve—lower	Aeromarine No. 6

AREAS

Upper wing with ailerons	434 sq. ft.
Lower wing	218 sq. ft.
Total wing area	652 sq. ft.
Horizontal stabilizer	53.0 sq. ft.
Elevator	35.5 sq. ft.
Vertical fin	21.5 sq. ft.
Rudder	21.6 sq. ft.

WEIGHTS

Weight, fully loaded	6100 lbs.
Weight, empty with water	3660 lbs.
Disposable load:	
5 passengers	900 lbs.
Crew of two	360 lbs.
Anchor and rope	60 lbs.
Miscellaneous equipment	60 lbs.
Fuel and oil	1060 lbs.
Total disposable load	2440 lbs.
Load per square foot	9.35 lbs.
Load per horsepower	15.25 lbs.

PERFORMANCE

High speed (1700 r.p.m.)	104.8 m.p.h.
Cruising speed (1400 r.p.m.)	80 m.p.h.
Min. flying speed (1150 r.p.m.)	60 m.p.h.
Landing speed (estimated)	50 m.p.h.
Ceiling, absolute	14000 ft.
Climb in 10 minutes	3300 ft.

There seems to be little question but that 17S alloy flying boat hull construction is here to stay and it is only a matter of time before all aircraft will be built of metal as is the railroad equipment of today and that this metal aircraft will be as far superior to the old type wooden planes as the new steel pullman coach is superior to the old wooden passenger car.

Some Impressions of American Non-Ferrous Metallurgy

A Report of a Lecture to the London Section of the British Institute of Metals, Delivered on November 8, 1923, by DR. W. ROSENHAIN, F.R.S., of the National Physical Laboratory, Teddington, England

Having been invited to visit America, primarily for the purpose of delivering a series of lectures on metallurgy, Dr. Rosenhain had an opportunity of seeing something of American science and industry in the North-Eastern States. Everywhere, and particularly in the non-ferrous industries, he was accorded a warm welcome and was shown everything which his time and physical endurance allowed him to see, and this in spite of the fact that some of the American brass manufacturers particularly are distinctly secretive in their attitude towards one another. He was very much impressed by the immense development of the non-ferrous industries and their remarkable organization for mass production. Everywhere, maximum output was regarded as the vital point and labor-saving devices of every kind were employed to an extreme degree —a tendency partly due to a definite shortage of labor of any kind and a still more marked lack of highly-skilled labor.

Beginning with the production of pure copper, the lecturer outlined the organization of the great Anaconda Copper Company, which now embraces not only copper mines and electrolytic refining works, but also the actual brass production works of the American Brass Company. He described the great refining works at Raritan (Perth Amboy) showing photographs of acres of electrolytic vats, and melting furnaces holding 300 tons of molten copper at a time, being handled on a scale recalling that of a large steel works. In connection with brass manufacture he gave an account of some of the more striking features of the processes used at the Bridgeport Brass Company, the Scovill Manufacturing Company and the American Brass Company, all situated near Waterbury, Connecticut. The most striking feature is the extensive use of the electric melting furnace, mainly of the Ajax-Wyatt induction type, which is rapidly ousting all others from the brass industry. Methods of casting, extruding, piercing, rolling, annealing and drawing brass in various forms were described and discussed. Among these the method of annealing brass tubes, and simultaneously straightening them by the passage of an electric current sufficient to heat the tubes to the softening temperature while they are under a moderate tension, may be mentioned as a feature, differing widely from English practice.

Turning to other metals, he describes the great development of the aluminium industry in America, particularly at Cleveland, O., in the hands of the Aluminum Company of America, under the scientific guidance of Dr. Zay Jeffries. Particular interest attaches to a large production of stampings and forgings, and their heat treatment by methods of double quenching, in special light alloys—many of these being connecting rods for use in standard American motor cars.

In spite of the marked depression of this particular branch owing to the effects of armament reduction, a remarkable new rolling mill for dealing with nickel has recently been installed at the Huntington (West Virginia) plant of the International Nickel Company. This is entirely electrically driven and controlled.

The general relation of science to the non-ferrous industries was next discussed, the impression formed by the lecturer being that these industries are very ready to avail themselves of scientific methods and appliances—more so than it the case in England—but that on the other hand America looks to England for metallurgical research and does not contribute adequately to the advancement of the science. In this respect the American non-ferrous industry lags seriously behind others—such as the great electrical and photographic companies, which have established research laboratories on a scale, both as regards equipment and staff, which are surprisingly large. An account was also given of the activities, in connection with metallurgy, of the United States Bureau of Standards—a Government institution which corresponds to some extent with the British National Physical Laboratory.

Summing up his impressions, the lecturer suggested that while British non-ferrous industries had much to learn from America in regard to the application of scientific methods and results, labor-saving devices and organization for production on a very large scale, America on the other hand showed decidedly less regard for the last refinements of high-quality materials and did not sufficiently encourage or provide for the wider aspects of metallurgical research even to the moderate extent to which this was being done at the present time in England.

Fine Wire

The Bell System Laboratories of the Western Electric Company, it is announced, have drawn wire as fine as 200-millionths of an inch in diameter for use in the construction of the vacuum thermocouple. Practically invisible to the eye as they are, it is found necessary to weld them together under the microscope for enclosure within the minute vacuum bulbs.

Thermocouples are required to adjust circuits in the vacuum tube repeaters on long distance telephone lines. In general these tiny glass bulbs are used to measure the small alternating currents in telephony and radio. The wires made up from a copper-nickel alloy used in fuses to protect the thermocouples are passed through an electrolytic acid both where they are eaten down to the size desired, it being impracticable to draw wire through dies as fine as is necessary.

Both copper-nickel and tungsten wires are used in this laboratory. The tungsten threads are the smallest of all, being only 200-millionths of an inch thick—a good one hundred of them would be required to make one wire the size of the hair on a person's head.—S. S.

A List of Alloys

Reprinted from the Booklet Published by the American Society for Testing Materials. Part 6*

By WILLIAM CAMPBELL†

COPPER-NICKEL ALLOYS

PER CENT	COPPER CU	NICKEL NI	OTHER ELEMENTS
Locomotive Tubes	97.	3.	
Driving Bands, Sheet	95.	5.	
Benedict Metal, Sheet, Tubes	86–84	14–16	
Blanko-Blech	80.	20.	
Cupro-nickel, Sheet	81–79	19–21	
Imperial Metal	80.	20.	
Turbine Material	79–81	21–19	Fe. 0.75 max.
Coinage	75.	25.	
Constantin, Resistance	60.	40.	
Constantin, Resistance	54.	45.	Mn, 1.0
Ingots for Nickel Silver	50.	50.	
Monel Metal, cast	28.	68.	Fe, 2.; Si, 1.; Mn, 0.25
Monel Metal, forged	28.	68.	Fe, 2.; Mn, 1.5; Si, 0.20

NICKEL SILVER

(Agiroide, Alfenide, Argentan, Arguzoid, Argyrolith, Electrum, Neusilberg, Nickelin, Maillechort, Packfong, Sterlin, Tutenag, White Copper, etc).

	COPPER CU	ZINC ZN	NICKEL NI	IRON FE	TIN SN	LEAD PB	OTHER ELEMENTS
Albatra Metal	57.5	22.5	18.75	....	....	1.25	
Ambrac	74.5	5.0	20.0	....	....	....	Mn, 0.50
Argentan:							
Sheet	40–65	17–32	15–20	....	....	....	
Chinese	40.4	25.4	31.6	2.6	....	....	
French	50.32	30.94	18.4	....	....	....	
Berlin	55.5	29.1	15.5	....	....	....	
Vienna	55.6	21.8	22.2	0.38	....	....	
English	63.36	17.01	19.13	0.38	....	....	
Russian	63.88	17.58	17.58	0.33	....	0.32	
Castings, Berlin	48.32	23.8	24.15	3.61	....	....	
Castings, Russian	57.52	18.94	20.35	3.15	....	....	
Solder	35.	57.	8.	....	....	....	
Alpakka	63.94	19.24	14.55	0.4	0.12	0.03	Ag, 2.02
Aluminum Silver	57.	20.	20.	....	....	....	Al, 3.0
American Silver, Cast	49.36	20.7	24.2	1.3	0.45	....	Mn, 3.83; Al, 0.13
American Silver, Cast	57.7	24.2	15.3	0.6	0.69	1.5	
American Silver, Cast	59.11	22.66	11.22	....	....	2.9	Al, 1.5; P Sn, 5.0
Aphit	70.	5.5	20.	....	....	....	Cd, 4.5
Aphit	75.1	2.37	20.75	....	....	....	Cd, 1.8
Arguzoid	55.78	23.2	13.4	....	4.03	3.54	
Aterite, Cast	66.75	17.25	13.92	1.58	....	0.18	Mn, 0.23; Al, 0.17
Aterite, Rolled	67.76	19.97	12.36	1.51	....	0.07	Mn, 0.16
Aterite, Rolled	46.96	38.	10.82	1.9	....	....	Mn, 2.24
Benedict Plate	57.	28.	15.	....	....	....	
Back Case Metal	62.	20.	18.	....	....	....	
Bismuth Bronze	45.	21.5	32.5	....	16.	....	Bi, 1.
Bismuth Bronze	53.	20.	10.	....	15.	....	Bi, 1.; Al, 0.1
Bismuth Brass	47.	21.	30.9	....	1.	....	Bi, 1.
Bismuth Brass	52.	12.	30.	....	....	5.	Bi, 1.
Brazing Solder	35.	57.	8.	....	....	....	
Brazing Solder	45.	45.	10.	....	....	....	
Carbondale	66.	16.	18.	....	....	....	
Casting	55.8	23.7	13.4	....	4.	3.5	
Casting	69.9	5.6	19.8	....	....	....	Cd, 4.7
Colorado Metal	57.	18.	25.	....	....	....	
Christofle Metal	(Silver-plated German Silver)						Ag, 2.0
Chromax Bronze	66.7	12.1	15.2	....	....	....	Al, 3.; Cr, 3.

* This booklet can be obtained from THE METAL INDUSTRY for $1. Parts 1, 2, 3, 4 and 5 appeared in our issues of March, April, May, July and September, 1923.

† Professor of Metallurgy, School of Mines, Columbia University, New York.

NICKEL SILVER (Continued)

	COPPER CU	ZINC ZN	NICKEL NI	IRON FE	TIN SN	LEAD PB	OTHER ELEMENTS
Cupping and Milling	58.	21.5	20.	....	....	0.5	
Drawing and Spinning	58.66	29.33	12.	....	....	....	
English	81.3	19.1	19.1	....	....	....	
Eighteen Per Cent	65.	17.	18.	....	....	....	
Electrum	51.61	22.58	25.81	....	....	....	
Fifteen Per Cent	56.66	28.33	15.	....	....	....	
Fourteen Per Cent	60.	26.	14.	....	....	....	
Fourteen Per Cent	56.	28.	14.	....	....	....	
Flat Ware Stock	53.	26.	21.	....	....	....	
Fricke's Alloys	55–50	31–30	19–17	....	....	....	
Bluish-Yellow, Hard	55.50	39.00	5.50	....	....	....	
Pale Yellow, Ductile	62.50	31.20	6.30	....	....	....	
Fricke's Silvery	50.00	18.80	31.20	....	....	....	
Fricke's Harder	69.00	30.00	10.00	....	....	....	
German Silvers:							
Best	46.	34.	20.	....	....	....	
Common Formula	55.	25.	20.	....	....	....	
Austrian Tableware (Gersdorf)	50.00	25.00	25.00	....	....	....	
Austrian Tableware (Gersdorf)	55.60	22.20	22.20	....	....	....	
Austrian Malleable (Gersdorf)	60.00	20.00	20.00	....	....	....	
Berlin Alloy	54.	28.	18.	....	....	....	
Richest	52.00	26.00	22.00	....	....	....	
Medium	59.00	30.00	11.00	....	....	....	
Lowest	63.00	31.00	6.00	....	....	....	
Birmingham (Hiorns):							
Extra White Metal	50.	20.	30.	....	....	....	
White Metal	54.	22.	24.	....	....	....	
Arguzoid	48.5	31.	20.5	....	....	....	
Best Best	50.	29.	21.	....	....	....	
Special Firsts	56.	27.	17.	....	....	....	
First Bests	56.	28.	16.	....	....	....	
Seconds	62.	24.	14.	....	....	....	
Thirds	56.	32.	12.	....	....	....	
Special Thirds	56.5	32.5	11.	....	....	....	
Fourths	55.	35.	10.	....	....	....	
Fifths, for Plate	57.	36.	7.	....	....	....	
French Alloy (Arcet)	50.00	31.30	18.70	....	....	....	
French Alloy (Arcet)	50.00	30.00	20.00	....	....	....	
French Alloy (Chaval)	58.30	25.00	16.70	....	....	....	
Russian	56.2	23.36	20.4	....	....	....	
Russian	51.4	22.32	26.22	....	....	....	
Russian	46.1	18.	35.8	....	....	....	
Sheffield:							
Common, Yellow	59.30	25.90	14.80	....	....	....	
Silver, White	55.20	24.10	20.70	....	....	....	
Electrum, Bluish	51.60	22.60	25.80	....	....	....	
Hard Alloy	45.70	20.00	31.30	....	....	....	
Key Stock	60.	26.	12.	....	....	2.	
Key Stock	65.	22.	12.	....	....	1.	
Knife Bolsters	68.	16.50	15.	....	....	0.5	
Knife Bolsters	56.	28.	16.	....	....	....	
Maillechort, Paris	66.24	13.42	13.42	3.21	0.22	0.15	
Maillechort, Vienna	66.6	13.6	19.3	0.48	....	....	
Maillechort	65.4	13.4	16.8	3.4	....	....	
Mangan-Neusilber	59.	20.	18.	....	....	....	Mn, 3
Mangan-Neusilber	65.	5.	10.	....	....	....	Mn, 20.
Mangan-Neusilber	72.25	8.75	16.57	....	....	....	Mn, 2.43
Milling	56.	31.	12.	....	....	1.	
Milling	56.5	28.	15.	....	....	0.5	
Milling	56.	27.5	16.	....	....	0.5	
Milling	54.	27.5	18.	....	....	0.5	
Naubuc Knife Stock	58.	16.25	25.	0.75	....	....	
Neogen	58.0	27.	12.	....	2.	....	Bi, 0.5; Al, 0.5
Nickel Bronze	60.	12.	20.	....	8.	....	
Nickel Bronze	47.	....	3.	....	10.	....	PSn, 1.0
Nickel Bronze	47.	21.	30.9	....	1.	....	Bi, 0.1
Nickel Bronze	50.	18.	12.	....	2.	18.	

NICKEL SILVER (Continued)

	COPPER CU	ZINC ZN	NICKEL NI	IRON FE	TIN SN	LEAD PB	OTHER ELEMENTS
Nickel Bronze	61.5	10.95	15.35	....	1.88	10.15	
Nickel Brass	50.00	34.9	15.	....	....	....	Al, 0.1
Nickel Bearing	50.	....	25.	....	25.	....	
Nickelin	55.3	13.1	31.07	0.43	....	0.18	
Nickel Oreide	65.50	32.66	2.	....	....	....	
Nickel Oreide	64.	32.	4.	....	....	....	
Nickel Oreide	63.33	31.66	5.	....	....	....	
Nickel Oreide	86.66	6.66	6.66	....	....	....	
Nickel Oreide	63.33	30.66	6.	....	....	....	
Optical Wire	54.	28.	18.	....	....	....	
Optical Wire	55.	27.	18.	....	....	....	
Packfong	40.4	25.4	31.6	2.6	....	....	
Packfong	26.3	36.8	36.8	....	....	....	
Packfong	43.8	15.6	40.6	....	....	....	
Platinoid	54.00	20.40	24.77	0.47	....	0.15	Mn, .15
Platinoid	60.	24.	14.	....	....	....	W, ½
Resistance Wire	56.50	25.50	18.	....	....	....	
Rheotan	52.	18.	25.	5.	....	....	
Rolling	49.	39.	12.	....	....	....	
Seawater Bronze	45.	5.5	32.5	....	16.	....	Bi, 1.
Silvel, Cast	67.93	15.84	6.52	2.22	....	0.48	Mn, 6.8; Al, 0.13
Show-case Metal	58.	24.	18.	....	....	....	
Show-case Metal	59.50	22.50	18.	....	....	....	
Sheffield	57.	24.	19.	....	....	....	
Sheffield	63.34	17.01	19.13	....	....	....	
Sheffield	62.63	26.65	10.85	....	....	0.2	
Sheffield	54.7	37.2	17.1	....	....	....	
Sheffield	57.4	26.5	13.0	....	....	3.0	
Smitter-Lenian	72.	9.75	12.75	2.	2.25	....	Bi, 1.
Spoons, Forks, etc.	60.	22.	18.	....	....	....	
Sterlin	68.52	12.84	17.88	....	....	0.76	
Sterline	68.	13.25	18.	0.75	....	....	
Suhler White Copper	40.4	25.4	31.6	....	....	2.6	
Ten Per Cent	56.	34.	10.	....	....	....	
Ten Per Cent	60.	30.	10.	....	....	....	
Ten Per Cent	62.	28.	10.	....	....	....	
Tuc-Tur, Rod	61.2	20.9	17.6	0.3	....	....	
Tuc-Tur, Sheet	58.6	28.5	12.5	0.3	....	....	
Turbine Bushing	61.5	10.95	15.35	....	1.9	10.15	
Tutenag	43.8	40.6	15.6	....	....	....	
Tutenag	45.7	36.96	17.33	....	....	....	
Tutenag	44.	16.	40.	....	....	....	
Toucas	35.75	7.14	28.56	7.14	7.14	7.14	Sb, 7.13
Tungsten Brass	60.	22.	14.	....	....	....	W, 4.
Turning	58.50	29.00	12.00	....	....	0–5	
Turning	65.	22.	12.	....	....	1.	
Twenty Per Cent	53.33	26.66	20.	....	....	....	
Twenty Per Cent	57.	23.	20.	....	....	....	
Twenty Per Cent	62.	18.	20.	....	....	....	
Twenty Per Cent	64.	16.	20.	....	....	....	
Twenty-one Per Cent	57.	22.	21.	....	....	....	
Twenty-one Per Cent	59.	20.	21.	....	....	....	
Thirty Per Cent	46.66	23.33	30.	....	....	....	
Thirty Per Cent	54.	16.	30.	....	....	....	
Victor Metal	49.94	34.27	15.4	0.28	....	....	Al, 0.11
Viennese Sheet	60.	20.	20.	....	....	....	
Viennese Ornaments	55.	25.	20.	....	....	....	
Viennese Tableware	50.	25.	25.	....	....	....	
Wagner's Formula	50.66	19.31	13.18	....	....	....	
Watch-case Bezels	60.	24.	16.	....	....	....	
Watch-case Bezels	63.	21.	16.	....	....	....	
Wessels Silver	51.	17.	32.	....	....	....	
White Copper	70.	18.	12.	....	....	....	
White Alloy	48.8	24.4	24.4	2.4	....	....	
White Alloy	53.0	23.0	22.0	2.0	....	....	

This list will be continued in an early issue.—Ed.

Graphites for Brass-Melting Crucibles

Experiments on the Value of American Graphite As Compared with the Imported Material*

By R. T. STULL and L. E. GEYER

PREVIOUS WORK

As outlined in previous papers[1], bond clays for graphite crucibles have been tested at the plant of the Detroit Lubricator Company, and the Detroit Copper and Brass Rolling Mills, Detroit, Mich.

These tests indicated that there were two American clays (Missouri pot clay and Illinois kaolin) that tested better than the Klingenberg (German) clay. Dorset (English) ball clay was tenth in the list.

MAKING THE CRUCIBLES

After it had been determined that American clays can be used successfully in graphite crucible manufacture and service, the next step in the investigation was to determine the value of American graphite as compared to the foreign. These final tests were carried out at the plant of the Detroit Lubricator Co., through the courtesy of Mr. G. B. Duffield. The crucibles, as previously, were made at the plant of the Vesuvius Crucible Company, Swissvale, Penna., from a formula compiled by the Bureau of Mines and under the supervision of Bureau engineers.

The graphites to be tested were given an initial to indicate their source. The number of crucibles made and shipped are set forth in Table 1.

TABLE 1

Mix	Name	Number of Crucibles
M	Montana	9
N	New York	10
R	Madagascar	9
K	Canadian	11
A	Alabama	11
C	Ceylon	10
T	Texas	10
X	Commercial	11
Y	Commercial	10

Since previous work had indicated that Missouri washed pot clay gave highest service among a number of clays tested as a bond for brass-melting crucibles, and Kentucky ball clay No. 4 gave crucibles of highest service in the tests of bond clays for steel-melting crucibles, a mixture of these two clays with pot shell and sand was used as standard for making the crucibles from the different graphites tested. All crucibles were therefore made from a body of the following composition:

Missouri pot clay (washed)	27%
Kentucky ball clay No. 4	13%
Pot shell	5%
Sand	5%
Graphite to be tested	50%
	100%

No special trouble was experienced during the fabrication of the ware. The body had sufficient plasticity to work well in the molds and there was no loss in the burning of the ware.

For purposes of comparison, two brands of commercial crucibles were included in the tests. One of these brands was that normally used at the plant where the tests were carried out, and the other was the product of a well-known manufacturer.

TESTING THE CRUCIBLES

Upon receipt of the crucibles by the Detroit Lubricator Company, they were placed in the dryer which is a room approximately 15 x 25 x 10 feet, heated by steam coils direct from the boiler room. The temperature is kept as near 220°F. as possible. The crucibles remained in this room for a period of one month before they were taken out for testing.

On taking the crucible from the drier, it was first charged in a manner similar to the practice used in the majority of brass foundries. The mixture consisted of lathe turnings, scrap castings, composition ingot and new metal. The crucible was first charged with the lathe turnings, then followed by adding the scrap castings, etc.

The furnace was operated on natural draft, and was fired by well selected and clean coke—the coke being packed around the crucible until it came even with the top. After the charge of coke had burned down, it was poked and tamped and more added to completely cover the crucible. At each firing and between firings, the condition of the melt was inspected and the charge poked down between firings, the condition of the melt was inspected and the charge poked down into the melted brass in the bottom of the crucible.

After the brass was melted and heated to the proper temperature for pouring the crucible was drawn from the pit and set in a shank where the coke was knocked off the outside and the metal slag "slushed" off the top of the melt. From the cleaning floor, the crucible was raised in the pouring shank and by overhead trolley, conveyed to the molds where the charge was poured. By the time the crucible was recharged and returned to the pits, it had cooled to a dull red heat. This practice was then followed until the crucible failed or showed signs of weakening to a point where it would not be safe to use it again. The practice was to run a crucible for a few melts before examination. After this it was examined after each melt for defects, and was finally discarded upon the judgment of the head melter. A similar practice was followed during the tests.

The composition of the brasses being melted at the time of the tests was as follows:

BRASS NO. 78		BRASS NO. 84
78%	Copper	84%
3%	Tin	4%
7%	Lead	4%
12%	Zinc	8%

It was the custom of the workmen to handle the crucibles with greater care than is usual in the majority of brass foundries. In this instance the crucibles were considered fragile instruments and the workmen handled them accordingly.

After the tests had been completed and the data compiled, the results indicated that the Alabama graphite gave the highest service of the seven different graphites tested for brass-melting work. Table 2 shows the order in which the graphites tested, together with the average number of heats and the average number of minutes per heat:

*Reports of Investigations, Bureau of Mines. Serial No. 2542, November, 1923.

[1]Stull, R. T. Graphites and bond clays for crucible making purposes: Mining Cong. Journ. Proc. 22nd Ann. Convention, 766, Nov. 17-21, 1919. Stull, R. T., and Bole, G. A. Graphites for Steel-Melting Crucibles: Bureau of Mines Reports of Investigations, Serial No. 2512, August, 1923.

TABLE 2

Graphite	Av. No. of Heats	Av. No. Minutes Per Heat
A (Alabama)	13.1	102.6
R (Madagascar)	12.4	96.1
C (Ceylon)	10.5	102.1
N (New York)	9.6	101.9
T (Texas)	6.8	97.7
M (Montana)	6.1	99.3
K (Canadian)	5.8	102.0
X (Commercial)	12.8	103.3
Y (Commercial)	11.9	95.1

DISCUSSION OF RESULTS

From the above it will be noted that the commercial crucibles X and Y which were the products of two well-known manufacturers used by the trade, did not test as high as the crucibles made from the American Bond clays and Alabama graphite, although both tested higher than the crucibles containing the Ceylon graphite. While the composition of these commercial crucibles could not be learned, it is known that they were not made from "all-American" materials.

During the war when the crucible manufacturers were required to use 20% of domestic graphite, the majority of manufacturers used the Canadian graphite because it was composed of larger flakes than the Alabama graphite. The results of the above tests indicated that the Canadian graphite gave lowest results of the seven graphites tested. It also shares lowest score with Montana graphite in test for steel-melting crucible (see "Graphites for Steel Melting Crucibles," Reports of Investigations, Department of the Interior, Bureau of Mines).

A record was kept of the cause of failure for each crucible tested and these are set forth in Table 3:

TABLE 3

Pinholing	32
Worn thin	14
Cracked in several places	15
Vertical cracks	11
Broken	9
Lateral cracks	4
Squeezed out of shape by tongs	3
	88

From a consideration of Table 3, it will be noted that the most frequent cause of failure was pinholing. The cause of pinholing was evidently not inherent in the material used, since three of the commercial (X) crucibles and six of the commercial (Y) crucibles failed from pinholing. It was noted that pinholing usually developed at or slightly below the slag line. The number of failures from three of the most frequent causes of failure for the crucibles containing the Alabama, Ceylon, Canadian and Madagascar graphites are shown in Table 4:

TABLE 4

Cause	Number of crucibles failing containing Alabama	Ceylon	Canadian	Madagascar
Pinholing	4	3	2	1
Too thin	3	1	2	3
[2]Cracked	4	6	6	4

Cracking was due in part at least, to laminations set up in the molds during the process of their manufacture. The laminations were plainly evident on several of the crucibles after several heats.

The time required to melt a charge did not vary as much between the several test crucibles as in the two commercial brands.

SUMMARY

From the data set forth in Table 2, it will be noted that Alabama graphite bonded with the American clays gave superior service, a service at least equal to the commercial crucibles of the same class which have been sold on the open market. Ceylon graphite which is considered by many manufacturers to be best for crucible work, was third in the list of tests and Canadian graphite which had been recommended very highly because of its structure, was last in the list.

While not sufficient number of crucibles was tested from which to draw definite conclusions, it is evident as far as the work has been carried, that American bond clays and Alabama graphite can be used to make a superior brass-melting crucible.

[2](This takes into consideration those crucibles cracked in several places—vertical and lateral cracks.)

Vaporized Metal Sprayed by Hot Blast

Bronze covered statues, copper-covered shingles, concrete piles, or railroad ties, and gold covered furniture are some of the possibilities ensuing from a process for spraying metals, which after years of study is approaching perfection at the U. S. Bureau of Standards. An exhibit showing stone, cement, metal, wood, and glass which had been coated by the new process attracted wide attention when shown by the Bureau in the recent Chemical Industries Exhibition in New York.

The essential of the process is that the metal is first vaporized and then sprayed onto the surface to be coated by means of a powerful blast which congeals it to the solid form as quickly as it strikes the surface. Details of the process are withheld by the Bureau at present for military reasons, except for the statement that it is based on a new principle and that electricity is used in the vaporization process.

Applications of the method, which results in a firm coating of metal upon any surface to which it is applied, are many and varied. Stone, wood, metal, and glass are all equally suitable basic surfaces. Pottery may be successfully coated with metal, pointing to important developments in the ceramic industries.

An important application is in the use of the metal coating in building construction. Shingles may be made fire-resisting by coating them with copper, which weathers well and produces an artistic green color on the roof. Experiments are already being made along the lines of copper coating other roofing material.

Soldering of metal to glass, a difficult problem, has been easily accomplished by means of this method. The glass is first coated with a layer of copper and the metal connection is then soldered to the copper. Processes somewhat similar are used for aluminum.

On the decorative side the uses of the method are many. Statues or other sculptured designs may be hewn from soft and easily worked stone and then coated with bronze, giving the effect of a bronze statue and weathering equally as well. Gold plating or decoration may be applied in the same way to furniture or table ware.

A coating of copper one thousandth of an inch in thickness may, so its inventors say, be applied at the rate of two square feet a minute and at a cost of two cents a square foot exclusive of the cost of labor. Cheaper and more easily fusible metals such as lead would cost less.—S. S.

Red Stains on Sheet Brass

A Discussion of the Causes and Methods of Prevention and Removal*

By E. A. BOLTON

MATERIALS USED

Samples of different kinds of sheet brass were kindly supplied for the research by Messrs. Earle, Bourne & Company, Ltd., and the following five alloys were chiefly used:

	A. Per Cent	B. Per Cent	C. Per Cent	D. Per Cent	E. Per Cent
Copper	62.36	63.50	65.02	70.72	72.56
Zinc (by difference)	37.28	36.02	34.67	29.21	27.04
Tin	....	....	....	....	....
Lead	0.27	0.35	0.20	....	0.27
Iron	0.09	0.13	0.11	0.07	0.13
	100.00	100.00	100.00	100.00	100.00

Several other alloys were used for special tests, including nickel silver and cupro-nickel, but most of the work has been done on brass C.

BAD MIXING OF THE ALLOY

No actual experiments were carried out in this section, but the theory seems to have no logical basis. Imperfect mixing in the works is so very rare[1] that it is quite impossible that it could account for the very considerable amount of staining observed in practice. In all cases examined by the author the stains have been superficial, and have been easily removable by abrasion or by certain etching reagents.

INFLUENCE OF SALT INCRUSTATIONS

Theory.—The stains are due to incrustations of salts left by the imperfect washing off of the pickling solution or by the use of an impure washing water after pickling. The crusts, so formed, decompose during the subsequent annealing, giving free acid, which attacks the zinc preferentially, leaving a coppery layer.

Experiments.—In order to test this supposition, experiments were carried out on lines similar to those of T. Turner.[2] In general, the results of the tests were in agreement with those of T. Turner, with the exception that the latter obtained no staining with zinc chloride solution, whereas the author obtained distinct red staining. The staining effects generally obtained were not so marked as those obtained by Turner, who annealed his specimens for a shorter period than the author. It appeared probable, therefore, that the stains might develop quite early in the annealing, and might then tend to disappear with extended time, owing to the diffusion of zinc from the inner layers into the surface coppery layer.

A few experiments completely confirmed this hypothesis. The disappearance of the stains with extension of the annealing period will generally not be complete, owing to partial oxidation of the coppery layer before the zinc has time to diffuse into it.

Works Observations.—The use of canal water for washing the sheets after pickling seems to have been given up almost entirely. Most of the works visited used either the town supply or else a fairly pure water from their own wells. It is quite impossible that the small quantities of salts deposited from such waters could cause the very severe staining noted in works practice. Again, many firms at the present time do not pickle their sheets until the final stages of the working, and so do not have at any time an annealing operation preceded by a pickling and washing. In such cases, therefore, the stains which occur cannot be due to the cause examined under this section. Cases of staining through the use of impure washing water are not entirely unknown, and are called in the works "water stains," to distinguish them from the usual red staining.

Conclusions.—Although salty incrustations from impure wash water can cause staining, the severe staining noticed in the works is certainly not due to this cause for the following reasons:

(a) The stains occur to quite the same extent even where no pickling and washing of the sheet has taken place prior to annealing.

(b) Even if the pickling and washing has been followed by annealing, the amounts of salts left on the sheet by the good quality water used nowadays must be much less than that present in some of the author's experiments in which practically no staining was obtained.

SOME REACTIONS OF THE OXIDES OF COPPER

Observations of Works Samples.—A number of pieces of brass covered with scale were obtained from the works and examined. It was found on pickling these specimens that, in most cases, red staining appeared where the darker parts of the oxide scale had been. The scale was removed from other similar areas by scraping or sand-blasting, and it was found that in practically all cases the metal was quite yellow underneath. Care, of course, was taken not to remove the actual surface of the metal itself. On placing some of this dark scale upon the surface of a piece of clean brass and then pickling the sample in 10 per cent sulphuric acid (a typical works pickling solution), it was invariably found that the sample became red stained wherever the scale had been placed. Thus it seemed quite certain that the red staining was not present in the metal prior to pickling, and that it was produced by the interaction of the oxide scale and the pickling medium.

Experiment 1.—The constituents of the scale upon brass are zinc oxide (ZnO), cupric oxide (CuO), and cuprous oxide (Cu_2O). As a rule, the zinc oxide is greatly in excess, owing to its greater heat of formation and to the volatility of the zinc. Pure samples of each of these three oxides were prepared.

The oxides, so prepared, were painted separately on to a number of samples of metal to form artificial oxide scales. These artificial scales were then removed by different acids and observations as to the amount of staining recorded. The results showed that zinc oxide is quite harmless, and that both cupric oxide and cuprous oxide cause severe red staining under ordinary pickling conditions. It may be noted that nitric acid will remove the stains in time, but that its use involves the loss of much of the brass.

* A paper presented at a meeting of the British Institute of Metals held September 10-13, 1923, at the College of Technology, Sackville Street, Manchester, England.

[1] See remarks of Bengough in reply to Rolfe, Journal of the Institute of Metals, 1922, 27, 69.

[2] Chemical News, 1891, 63, 227.

The action of cuprous oxide has been noted before, and was referred to by Bengough and Hudson[3].

The action of cupric oxide seems not to have been noted before. It has generally been assumed that this oxide is quite harmless, and that the reaction proceeds as follows: $CuO + H_2SO_4 = CuSO_4 + H_2O$.

In the absence of a metallic sample this is the case, but immediate contact with an alloy containing copper quite disturbs the ordinary course of the reaction. Even standard silver can be stained by means of cupric oxide and sulphuric acid.

Experiment II—Since the red staining observed in works practice does not appear to be present (in most cases) prior to pickling, it seemed possible that the use of other pickling media might prevent the formation of stains.

Of a number of different solutions tested, only those containing dichromate, permanganate, or hydrogen peroxide were successful in preventing the formation of stains or in removing already existing stains. The dichromate is easily the most efficient and convenient to use. A number of firms are using solutions of sodium dichromate for removing red stains, but others find it too costly, and some claim that it confers an etched appearance on the brass. It is interesting to note in passing that Parish took out a patent[4] for the pickling of brass as follows:

"A solution of sulphuric acid, reinforced by a per-acid, is used for removing 'blotches' from the surface of annealed brass."

Experiment III.—Experiments were carried out to determine if a relationship existed between temperature and time of annealing, and the amount of copper in the scale. Three typical brasses were annealed for various periods at a series of temperatures, but in no case could any connection be traced between the annealing treatment and the amount of copper in the scale.

Conclusions:

1. Most of the staining observed in practice is produced by the interaction of copper oxides in the scale with the pickling acid.
2. No evidence has been found of any relationship between the temperature and time of annealing, and the copper content of the resulting scale.
3. 70:30 metal stains worst, 65:35 metal next, and 62:38 metal least.
4. The red stains may be removed by means of a strongly oxidizing pickle, such as dichromate solutions.

INFLUENCE OF IRON

Theory.—The red stains are caused by the presence of iron on the surface of the sheet, setting up a couple action during the pickling. The iron is either present in the brass itself in the free state, or is carried over from the coal used in firing the furnace.

Experiments.—It was found that iron oxides present either during annealing or pickling were practically harmless, but metallic iron caused staining of the brass upon pickling, particularly when the pickling solution contained some copper sulphate.

Works Observations.—The presence of iron in the brass itself will cause staining if the iron is present in the free state. Since, however, most of the brass produced in the works contains only very small percentages of iron, it is certain that this is not the cause of the staining noted in the works.

Consideration of the other view, that iron is deposited on the sheet from the ash of the coal used for firing the furnace, soon shows it to be quite untenable. Any small quantities carried over during the annealing would be present on the sheets as oxide, and then diluted with about 90 per cent. of the other constituents of the ash.[5]

The author has seen cases where rolls of brass have been tied up with iron wire during the annealing. Copper oxide scale has formed under the wire and has caused staining of the brass in the pickle tank, the wire having been removed before the pickling. The use of iron wire for this purpose should be avoided, and it is noteworthy that some firms use brass wire instead.

Conclusions:

1. Iron, and to a less extent iron oxide, can cause red staining of sheet brass under certain conditions.
2. The stains noted in the works are certainly not due to iron, for reasons discussed above.

THE VOLATILIZATION AND DIFFUSION OF ZINC

Volatilization of Zinc.—There has been a theory quite widely held that zinc is lost from brass on annealing, and that sufficient is lost to cause the surface to become highly copper-rich and so appear red stained. It has been assumed that variations of furnace conditions can materially affect the rate of volatilization of the zinc. The temperature of the brass is one of the most important of these variables, and it is evident that increasing temperature will favour the loss of zinc. It has been variously assumed:

(a) That oxidizing conditions accelerate the loss.
(b) That reducing conditions accelerate the loss.

In the author's experiments, the loss of zinc by volatilization in hydrogen, other factors being equal, was in the majority of cases much greater than the total zinc loss in other gases (**i.e.** the sum of the zinc lost as vapour and that lost by direct oxidation). In one case, where the specimen was heated for one hour at 750° C. in hydrogen, it lost 24 per cent. of its total zinc, but yet there was no staining, the surface appearing slightly richer in copper than before.

Reference must be made to a paper by Bengough and Hudson[6] on the annealing of brass. They annealed a few bars of 70:30 brass under different conditions, and then analysed turnings taken at different depths from the surface for copper percentage. Even under the drastic conditions used by these authors (one of the bars was annealed at 920° C. for 2½ hours in a reducing atmosphere), the copper content of the surface layers had increased only from 71 per cent. to 76½ per cent.

The author has been told by Professor T. Turner that in his experiments, although the zinc was evolved with great rapidity **in vacuo**, no red coloration of the surface of the brass appeared until most of the zinc had been evolved.

Diffusion of Zinc.—It is therefore certain that there must be some other factor operating to neutralize the loss of zinc from the surface of the brass. That factor is the diffusion of zinc from the interior to the surface layers. In order to test the rate of diffusion, samples of brass containing 72½ per cent. of copper, which were badly red stained, were heated in hydrogen for short periods at different temperatures. It was found that at 500° C. fifteen minutes sufficed for the removal of stains, while at 600° C. only five minutes were required.

[3] Journal of the Institute of Metals, 1919, 21, 167.
[4] U. S. A. Patent 1,106,107, August 4, 1914, R. R. Parish.
[5] Hofman, "General Metallurgy" (1913), p. 165.
[6] Journal of the Institute of Metals, 1916, 4, 92.

Thus it apepars certain that although the conditions were favourable to the rapid volatilization of zinc, the diffusion of zinc was sufficient not only to prevent the formation of stains, but to remove already existing stains.

Experiments proved that although samples of brass could be heated in air until portions fused, yet no red staining would be caused, thus showing that the increase in the rate of volatilization was compensated by a corresponding increase in the rate of diffusion.

Conclusion.—Simple volatilization of the zinc (without oxidation) cannot cause staining by leaving a red copper layer, owing to the compensating effect of zinc diffusion.

EFFECT OF LUBRICANTS

Theory.—In works practice, oils and greases are extensively used for decreasing the friction between the metal and the rolls. During a subsequent annealing, the oil chars and collects in patches, causing increased volatilization of the zinc at those areas, and so causing stains.[7] A second theory differentiates between good oils and bad oils, and traces the staining to the influence of dissolved inorganic salts, alkalies, and free acid. A third theory is that large amounts of sulphur in the lubricant cause staining.

Experiments.—The following oils were tested: seal oil and a pure vegetable oil as supplied to brass-rolling mills, a mixture of rape oil and whale oil used by a well-known works, a mixture of 40 per cent. whale oil and 60 per cent. pure mineral oil used by another noted rolling-mill, a miscible or soluble oil, a shale oil containing 5.9 per cent. of sulphur, and finally soap and soapsuds. In addition, the three acids, palmitic, stearic, and oleic, were tested, in order to determine the effect of free acid in a lubricating oil. The experiments indicated that the pure oils, such as seal oil, vegetable oil, and the oils generally used in the works, are practically harmless, only very slight stains being caused in three cases out of sixteen tests. These oils were found to be neutral in character, and to leave an inappreciable residue on burning in air. The less pure oils, such as the soluble oil and the shale oil, and also, as one would expect, the three acids, do cause staining to some extent, particularly with high copper brass. The effect seemed to be increased slightly by allowing the specimens to heat gradually. Of these impure oils, the soluble oil was strongly alkaline and left a residue on ignition of about 1½ per cent. of sodium carbonate. The shale oil containing 5.9 per cent. of sulphur was also slightly alkaline. The theory that the reducing conditions caused by the charring of the oil cause staining by very rapid local volatilization of the zinc is quite disproved by the fact that none of the oils caused staining in carbon monoxide.

Works Observations.—Inquiry at the works visited showed that the ordinary animal and vegetable oils are used in the rolling-mill, and no cases have been observed in which impure oils likely to contain inorganic matter are used. Cases have been noticed, however, in which soapsuds have been used for lubricating purposes, with the production of considerable staining after annealing.

Conclusions:

1. Impure oils can cause staining of sheet brass.
2. Pure oils are almost entirely used in the works, and so the staining is very rarely due to this cause.
3. Where oils do cause staining, the action is due to the presence of dissolved alkalies, salts, or acids, and is not due to the local reducing conditions caused by the charring of the oil.
4. Soapsuds should not be used where freedom from red stains is desired.
5. The presence of sulphur in the oils is not very harmful, as with an oil containing 6 per cent of sulphur (a very extreme case) no very marked staining effects were observed.

[7] T. Vaughan-Hughes, Journal of the Institute of Metals, 1911, 6, 316.

INFLUENCE OF FURNACE CONDITIONS

Theories.—The red stains observed in works practice are due to irregularities of conditions in the annealing furnaces. There is considerable variations of opinion as to the exact conditions which give rise to the staining, but the following theories have been advanced:

(a) The staining is due to the furnace gases having a reducing character and thus allowing ready volatilization of the zinc.

(b) The staining is due to the presence of sulphur dioxide through the use of a coal rich in sulphur.

(c) The staining is due to the impinging of smoky flames on to the metal during the annealing.

Experiments A.: The Effect of Gases

Five different brasses of the composition given were used in the experiments, and annealings were carried out in the following gases: Carbon dioxide, a mixture of equal volumes of carbon dioxide and carbon monoxide, carbon monoxide, water vapour (and air), and hydrogen.

In carbon dioxide only very slight staining occurred in a few experiments. In carbon monoxide there was only slight tarnishing, and indeed it was proved that previously existing stains could be removed by heating the specimens in carbon monoxide. [In spite of precautions taken to purify this gas, slight oxidation of the zinc still occurred.] No staining was obtained in the mixture of carbon monoxide and carbon dioxide. Considerable staining occurred in the experiments with water vapour, but both air and liquid water were present, so that there is no analogy between these experiments and the annealing in dry steam carried out in some works to prevent staining. No staining occurred on heating the brass in hydrogen, and previously existing stains could be removed quite easily by heating the specimens for a short period in hydrogen. It thus appears that the stains observed in the works are not produced by the action of any of the above gases. An interesting fact, which confirms the statements of Vaughan-Hughes,[8] is that a single gas favours, and a mixture of gases tends to inhibit, the volatilization of zinc.

Experiments B.: The Effect of Sulphur Dioxide

A number of samples were annealed in an atmosphere of sulphur dioxide. A black scale, composed of mixed oxides and sulphides, formed, which invariably gave rise to red staining upon pickling. Hayward annealed some of his specimens in a mixture of carbon dioxide and sulphur dioxide, and obtained results similar to those of the author. A few more experiments were carried out in which samples were annealed in a muffle furnace into which fragments of sulphur were introduced from time to time. No staining was obtained in these cases, although the sulphur dioxide present must have been much greater than that present in the works annealing furnaces. This result agrees with those of T. Turner.[9]

Experiments C.: Effect of Flames, &c.

1. **Charcoal Experiments.**—A number of samples of

[8] Journal of the Institute of Metals, 1912, 7, 105.
[9] Chemical News, 1891, 63, 227.

metal were taken and annealed in various ways, as given below:

(a) Beneath the surface of charcoal powder.
(b) Beneath the surface of charcoal ash.
(c) About ½ inch above the surface of charcoal powder contained in an open dish.
(d) About ½ inch above the surface of charcoal powder in a closed tin.

Considerable staining occurred in a number of cases, both when the specimens were embedded in charcoal and when the specimens were suspended above the charcoal. It could not be definitely stated that no coppery patches existed before pickling, but most of the stains were certainly produced by interaction of the copper oxides with the pickling acid. It was not quite clear from these experiments whether it was the actual contact with the charcoal itself which caused the staining, or whether the action was due to gases which would circulate very freely through the porous charcoal, so that a fresh series was carried out as below with graphite.

2. **Graphite Experiments.**—In these experiments, strips of brass with various copper contents were partly embedded in graphite contained in an open fireclay dish. The strips were bent, so that the covered part was horizontal and the uncovered part was vertical. The specimens were then annealed for about fifteen minutes at 700° C. The portions of the strips that had been covered with graphite were in all cases practically free from stains, while the uncovered vertical portions were stained quite typically at those portions upon which the carbon monoxide flame had been observed to be playing. Repetition of the experiments gave similar results. The graphite was analysed and found to contain 18 per cent. of ash and 1 per cent. of moisture. The sulphur content was very low, only 0.027 per cent.

It is thus certain that the staining caused by annealing in graphite could not be due:

(a) To the ash, because the covered parts of the sample were free from stain.
(b) To the sulphur, because of the very low sulphur content of the graphite.
(c) To the moisture, since that would all disappear at the commencement of the first heating. (The same graphite sample was repeatedly used.)

It has been shown that the gases carbon dioxide and carbon monoxide do not cause staining, so that the staining in these experiments was caused by the flames of the burning carbon monoxide.

3. **Coal Experiments.**—Experiments similar to those made with graphite were carried out with coal containing 59.5 per cent. of coke, 4.5 per cent, of ash, 10 per cent. of moisture, and 1.2 per cent. of sulphur.

Again there was much staining where the flame had impinged. There was also staining in some cases upon the covered portions, but this was possibly due to the influence of the sulphur present in the coal, as the part that had been covered did not pickle so easily as the uncovered part. As further confirmation, samples were annealed in the same muffle in the same dish, but in the absence of the graphite or coal. These samples did not stain. Other samples were annealed in the same muffle, but in this case coal was burning at the back of the muffle and giving off smoky flames. Again specimens stained when annealed in the path of the flames.

Summary of the Effect of Flames.—It appears that when hot flames or hot gases are allowed to impinge upon brass which is being annealed, the formation of copper oxide takes place and staining arises during the subsequent pickling. It should be emphasized:

1. That perfectly clean brass can be stained in this way.
2. That the presence of sulphur is not necessary.
3. That the effects were obtained by the author in about ten minutes.

Works Observations.—In the works, much of the metal is annealed in coal-fired furnaces, in which the smoky flames pass over and impinge upon the metal. Large sheets of brass are usually superimposed during the annealing, while strips are frequently annealed in the form of loose coils. It is found that by far the greater part of the staining occurs along the edges of these sheets and rolls in the form of wavy lines, while the middle portions are usually practically free from the defect. The outer portion of a coil is usually stained over the entire exposed part.

In the case of sheets, the top sheet may be stained over a considerable area on its upper surface. The author has seen both the smoky yellow flames from the coal and the blue carbon monoxide flames playing round the metal and impinging upon those parts which are found to stain.

Many furnaces are in use in which the metal is completely protected from the flames and hot gases, and it is found that by far the greater part of the trouble with red staining is thereby overcome.

The presence of sulphur in the coal is an unimportant factor, owing to its small amount and to the fact, proved by the graphite experiments, that the reactions proceed to quite the same extent in the absence of sulphur in the fuel.

It is felt that the result of the experiments carried out in this section, taken in conjunction with the observations made in the works, are sufficient to prove that the majority of red stains observed in practice are due to the use of furnaces in which the flames are allowed to play on to the metal.

Conclusions:

1. Red stains may be caused through the impinging of flames upon the metal during annealing, and most of the stains observed in the works are produced in this way.

2. The presence of sulphur dioxide in quantity will cause staining, and so will the condensation of moisture on the hot metal, but for reasons given above these are at the most only subsidiary causes.

SUMMARY OF PAPER

In the various sections possible causes of red staining have been examined, including bad mixing of the original strip, salty incrustations left by imperfect influence of furnace gases, with special reference to washing after pickling, the influence of iron, the effect of pure and impure lubricating oils, the volatilization of zinc, the influence of furnace gases, with special reference to sulphur dioxide and water vapour, and finally the effect of flames. It has been shown that, under certain conditions, any one of the above factors may cause staining to a greater or less extent. The reasons for and against each particular factor have been examined in the light of works practice, and conclusions drawn on each section.

To these may be added the effect of what is best described, in view of lack of knowledge as to its chemical and physical significance, as "sheer dirt." This latter is a factor which generally assists all the main causes of staining, although its own special effect is probably less important and cannot be isolated.

As a general summary of the causes of stains, it may be stated that the mechanism consists of:

(a) The temporary formation of a copper-rich layer on the surface of the brass.

(b) The oxidation of this layer before diffusion of zinc can take place.

(c) Reaction between the copper oxides so formed and the pickle acid, with the deposition of a copper film on the sheet.

Examinations of the factors causing staining shows them to consist of agencies which remove zinc rapidly either by chemical attack (including oxidation) or by volatilization.

It is not claimed that the matter has been enirely cleared up, but a wide field has been covered, and sufficient has been done to show the great complexity of the subject of red staining.

CONCLUSIONS

General Conclusions.—1. The main cause of the red staining observed in the works is the impinging of hot flames and gases on to the metal during the annealing.

2. The chief subsidiary causes are:

(a) The influence of salt and acid left by imperfect washing of the sheets after pickling.

(b) The use of impure rolling oils.

(c) The presence of iron in some form during the annealing or pickling.

(d) The presence of much sulphur dioxide in the furnace gases.

(e) The deposition of water or to the red hot metal.

3. The staining becomes more severe as the copper content of the brass in increased.

Minor Conclusions:

1. Alloys of copper other than brass and containing no volatile constituent can be caused to red stain.

2. Red stains can be caused to disappear by means of a short annealing at 600° C., under strictly non-oxidizing conditions.

3. Cupric oxide, in the absence of a metallic sample, dissolves in dilute sulphuric acid, but in the presence of an alloy containing copper a film of copper is deposited on the metal.

4. When brass is annealed in air there is no relation between the temperature and time of annealing and the quantity of copper oxide in the scale.

5. Red staining may be removed from brass by the use of a pickling solution containing a salt of a "per-acid."

PREVENTION AND REMOVAL OF RED STAINING

Prevention.—Since the causes of staining are so diverse, it is obvious that the prevention of staining is going to be a very difficult matter.

The use of closed annealing furnaces will obviate many of the causes of staining, and fairly good results are obtained by the firms which use closed furnaces. Many of these furnaces are improved by the provision of water seals to the charging doors. The greatest point urged against these furnaces is the fuel cost, which is much greater than in open or "inflame" furnaces. It should be pointed out, however, that it may be cheaper to burn coal than good brass. Many of the smaller strips in the works are annealed in closed pots, and here it is found that very little staining occurs. Since most of the stain occurs through reactions in the pickling tank, it seems possible that the trouble may be eventually overcome by the abolition of the pickling operation and the removal of the scale by a scouring or by sand-blasting.

As regards the staining caused by oils and greases, it has been suggested that the grease should be removed by caustic soda solution before the annealing, but unless the caustic soda is thoroughly removed it will be more harmful than the grease itself.

T. Vaughan-Hughes[10] states that the maintenance of a stream of inert gas or vapour directed against the incoming charge removes the cause of surface stains very effectively. It has been suggested that salt-bath annealing would probably overcome the staining trouble, since oxidation would be prevented.

Removal of Stains.—The use of a pickling solution containing dichromate has been referred to already, and is used with excellent results in some works. The most economical method appears to be the removal of all scale in the ordinary pickling solutions, and then the removal of stains as a final operation.

The only alternative appears to be a final annealing of short duration at 600° to 650° C. in an inert gas, preferably hydrogen. This could be used only for small work probably.

[10] Journal of the Institute of Metals, 1911, 6, 316.

Prevention of Corrosion of Steel

In a recent article by Professor B. Zschokke, of the Federal Laboratory for Tests of Materials at Zurich, Switzerland, in the Revue de Metallurgie, on methods of preventing the corrosion of steel, he gives the results of experiments in which iron and steel were exposed to various solutions. These results may be briefly tabulated as follows:

1. Aqueous solutions of salts of chromic acid after reaching a certain concentration preserve iron from rust for an unlimited time without the protecting action of the solutions becoming enfeebled or exhausted.

2. The passivity contributed to iron by these solutions only lasts so long as the metal is immersed in them. If the solution is removed the protection disappears and when the same sample is placed in ordinary water it begins to rust in a short time.

3. The concentration limit of a solution at which it exerts its maximum protection is not a constant amount. The action of the solution depends considerably on the ratio between the total amount of solution and the surface of the metal. If the surface is increased, either more solution must be used or its strength increased.

4. The anti-rust solutions exert their protective action not only at ordinary temperatures but at higher temperatures, up to 100 deg. C. for example.

5. The addition of certain salts to these solutions, notably the chlorides of the alkalies and alkaline earths, and also to an extent not quite as great, the sulphates of these metals, reduce, paralyze or reverse the protective action of the chrome salts, while other salts such as, for example, the carbonates of the alkalies and lime reinforce their action.

6. The protecting action of the chromic acid salts is not exerted solely on all kinds of iron and steel but on other metals such as copper, tin, brass, bronze, etc., whether they are isolated or in metallic contact with iron. For instance, small samples riveted together have been immersed in a 2 per cent solution of bichromate of sodium and are as brightly polished today as at the start of the test.

7. The protective action of these chromic acid salts is not alone on the parts of the metal in direct contact with the liquid but extends for a certain distance to the neighboring parts.

It is stated that numerous experiments extending over six years have shown that a solution with 0.1 and 0.2 per cent potassium or sodium chromate rendered slightly alkaline with sodium carbonate, suffice in most cases to protect iron and steel from rust.

Survey of Nickel Solutions

To Bring Out in an Orderly Fashion, Much of the Data on Nickel Solutions Scattered Throughout Various Sources That Will Be of Value to the Electro Plater and to Refute Some Statements Are the Purposes of This Article—Part 6*

Written for The Metal Industry

by JOSEPH HAAS, JR.

GENERAL METHODS OF OPERATING NICKEL SOLUTIONS

Nickel solutions are generally operated at the temperature of the room in which they are situated, although hot solutions 100° F. to 120° F. have found quite extensive application. Whenever the general nature of the work and the general situation of the baths permit, mechanical agitation or movement of the cathode should be employed, so that high current densities may be used. Mechanical agitation of the cathode is preferable in nickel solutions to air agitation, because air agitation is said to produce and accentuate pitting. Mechanical agitation of the cathode is also preferable to air agitation, since sludge formation in nickel solutions cannot be entirely eliminated, air agitation is sure to produce a rough or gritty deposit.

It does not seem to be generally appreciated that nickel solutions are very sensitive to changes in temperature, so that one generally finds no provision made for keeping the solutions at a moderate temperature. Nickel solutions should never be allowed to drop in temperature below 60° F. because the deposit will lose some of its whiteness, and the C. D. will be lower than that generally desired, and if the articles are plated only the same time as at a higher temperature, the deposit will be thin. Furthermore, the deposit will be found to be brittle. Should the temperature of the nickel solution fall below 50° F., peeling will inevitably result, if plating is carried on under the same current conditions as with higher temperatures. Many platers have looked seriously to the compositions of their nickel solutions, thinking that there was something seriously wrong, when in reality all that was needed was a little heat. A prompt remedy, if heating is not available, is to reduce the voltage on the tank to about 1.3 volts or a current density of two or three amperes per square foot, and allow the work to plate longer.

NICKEL ANODES

Nickel anodes serve two distinct purposes: First, to bring the current to the bath; and, second, to maintain, more or less, the metal content of the solution. Anodes are furnished by the manufacturers in various shapes depending upon the service required. In general the most economical shapes are those that

1. Provide a large surface exposed to the solution in proportion to their weight.
2. Which reduce to a minimum the percentage of final scrap.

The elliptical, oval, octagonal and two-bar have, so far as I have seen, been found the most economical shapes to use, and have almost entirely supplanted the flat anode. One of the most common and most expensive fallacies encountered in nickel plating is the attempt to plate with insufficient surface area of anodes. To plate with insufficient anodes generally leads to two difficulties—impoverishment of metal in the solution and increase in acidity of the solution.

Nickel anodes must have certain properties which render them soluble in nickel solutions, so that most of the metal deposited at the cathode will be dissolved from the anode. If the anode is not freely soluble, then we soon find that the bath becomes acid in proportion to the unsolubility of the anode. There are certain conditions under which a base metal, which under ordinary conditions is dissolved as required by its valence and Faraday's law, will act like a noble metal. This behaviour is called "passivity," and for nickel anodes has not been entirely defined, but is now believed to be due to the method of manufacture. Such a condition of passivity will soon manifest itself in poor cathode efficiency and a brittle deposit. The general characteristics of nickel anodes can be stated as:

1. Good solubility so that a current efficiency of 90 per cent or more can be obtained.
2. That the anode dissolve regularly without disintegration.

Like the purity of salts used in making up nickel solutions, the purity of the anodes should be the highest obtainable that will give satisfactory solution and anode efficiency. Practically every impurity in the anode passes into the solution and will in time jeopardize its successful operation. What impurities and to what maximum per cent permissible has not as yet been definitely decided. C. P. Madsen states that manganese and tin are not permissible in nickel anodes, as the anodes containing them show greater deterioration. Nickel anodes used most in the trade consist of 90 per cent to 92 per cent, 95 per cent to 97 per cent purity, with increasing tendency toward the 95-97 per cent purity. The 85-87 per cent anode has been practically eliminated.

Equal in importance to the purity of the anode are the metallurgical characteristics of nickel anodes. This view has received but scant attention in the past, but there is every indication that a metallurgical standard as well as a chemical standard will soon be determined. Regardless of the external appearance, there is a great difference between properly and improperly made anodes. This difference does not ordinarily show up until the anodes have been in service some time. To be metallurgically correct, a nickel anode should be of proper hardness throughout, and should possess a definite metallic structure. Anodes which are correct from a metallurgical point of view are homogeneous throughout. They possess a particular and characteristic structure when examined under the microscope; they should be entirely free from granular structure and non-metallic inclusions other than carbon. Of the anodes used in the trade, cast nickel anodes have the preference, on account of their greater ease of solubility over the rolled nickel anodes. Rolled nickel anodes are used in nickel solutions when nickel solutions exhibit an excessive cor-

*Parts 1, 2, 3, 4 and 5 were published in our issues for September, 1921; November, 1922; February, June and July, 1923.

rosive action upon cast anodes, so that the proper acidity of the bath cannot be maintained, the bath tending to work toward the alkaline direction.

Below, in Figures 1 and 2, are microphotographs of a nickel anode that dissolved unsatisfactorily in the plating solution. The anode did not dissolve regularly, as at times it appeared that the anode did not dissolve at all, and at other times the solution would be very irregular. Pieces or scales could be picked off the anode. The chemical composition was:

Nickel	95.00%
Copper	0.54%
Iron	2.64%
Tin	0.60%
Carbon	0.65%
Silicon	0.42%
Manganese	0.03%

MICROSCOPIC EXAMINATION OF CAST NICKEL ANODE*

The structure of the nickel as seen in the unetched condition and also after etching with concentrated nitric acid is shown in Fig. 1, A and B at a magnification of 100 diameters.

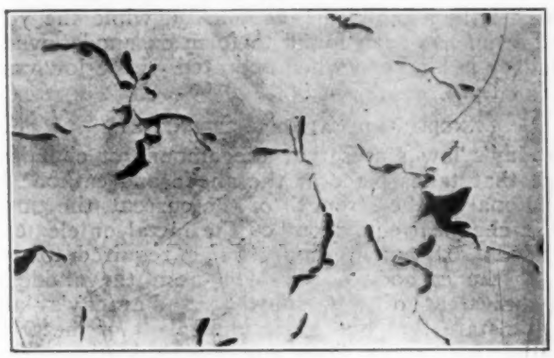


FIG. 1-A. CAST NICKEL ANODE X 100

The metal contains some graphite but considerably less than has been observed in other anodes. After etching, the crystals show the characteristic tree-like network often found in crystals of cast nickel. In addition, the etching reveals more clearly the numerous inclusions of a non-metallic nature which in the unetched section are only very faintly revealed. The nature of these inclusions cannot be stated with certainty from the microscopic examination alone; presumably they are either oxide or sulphide. It seems possible that their presence might account for the irregular corrosion of the anode.

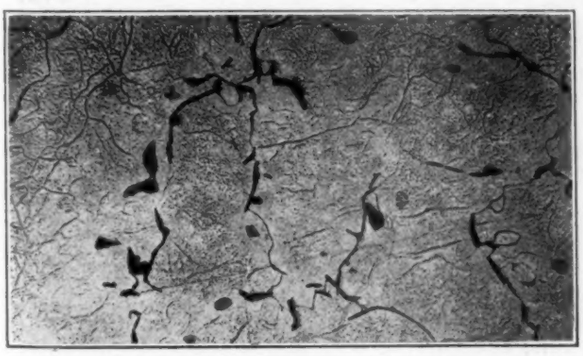


FIG. 1-B. CAST NICKEL ANODE X 100

Fig. 2 shows the material just beneath the surface, in an unetched condition (x 50). The surface layer is relatively free from graphite and is very porous and "ragged" in appearance.

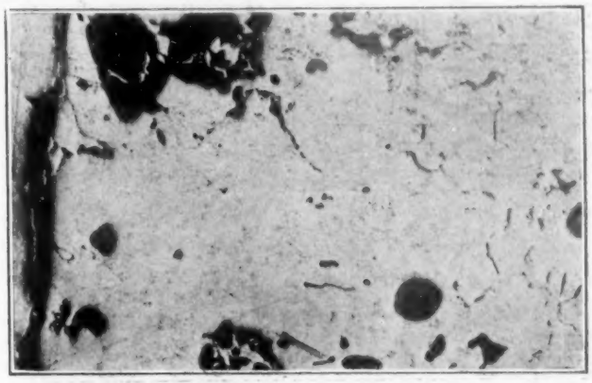


FIG. 2. MATERIAL JUST BELOW SURFACE OF ANODE X 50

On the other hand, Figure 3, A-B-C, shows the microstructure of a nickel anode that is considered typical of that found in large sand-cast anodes, which usually dissolve satisfactorily. The coarse structure indicates a low content of dissolved carbon, and the presence of graphite in coarse particles forms a sludge that quickly settles in the solution. As indicated by the metallurgical examiner, no difficulties have been experienced with the solution of this anode. The analysis of this anode is as follows:

	USED	UNUSED
Nickel	97.30%	97.10%
Carbon	1.40%	1.48%
Iron	1.01%	0.85%
Silicon	0.19%	0.22%
Copper	0.11%	0.11%
Manganese	0.01%	0.01%

FIG. 3-A. EDGE OF UNCORRODED ANODE COPPER-PLATED ON LEFT SIDE X 50

In electro-plating operations, the cathode has naturally been the point to which most attention has been directed, but a study of the conditions at the anode is equally important and has revealed that if the corrosion at the anode is satisfactory the cathode will largely take care of itself. The lack of efficient corrosion at the anode results in an excess of acid being formed, which, diffusing through the solution, gives it a lower p. H. (increase in acidity) and causes a lower efficiency at the cathode as well. A change in the efficiency at the anode is in a very short time made apparent by a similar change at the cathode.

*By courtesy of the Bureau of Standards, Washington, D. C.

The best method of checking the corrosion at the anode has been found to be by a determination of the polarization voltage. This polarization voltage is

FIG. 3-B. INTERIOR OF ANODE SHOWN IN FIG. 3-A X 50

determined by shutting off the rheostat and immediately reading the voltage registered by the voltmeter. The polarization voltage should not be greater than 0.70 volt; when above that the assumption is justified

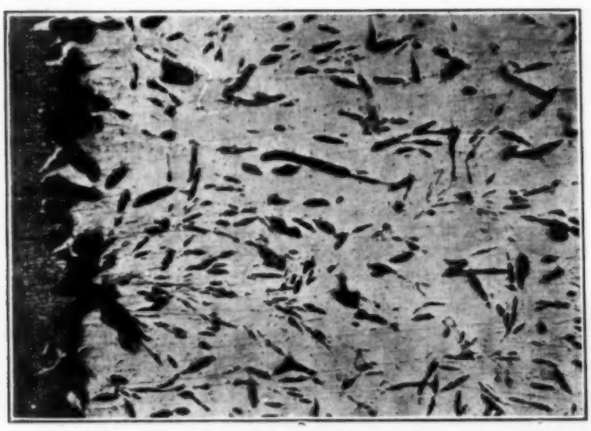


FIG. 3-C. EDGE OF CORRODED ANODE, COPPER-PLATED

that the anodes are corroding poorly; if below 0.70 volt the efficiency of the anode is as high as can be obtained.

SLUDGE FORMATION IN NICKEL SOLUTIONS AND COATINGS OVER ANODES

Sludge formation cannot be entirely blamed on impurities found in nickel anodes. Some will form even if anodes of the highest obtainable purity are used. The composition of the solution has much to do with sludge formation. When only the double salt solution is used, with only the addition of sodium chloride, sludge forms in large amounts. Solutions containing sodium chloride will accumulate considerable sludge, unless the acidity is kept very high. But solutions that are operated with ammonium chloride, especially if boric acid is also used, will be found to contain the minimum amount of sludge. It is believed that sludge formation depends to a great extent upon the following factors:

1. Degree of acidity.
2. Presence of substance possessing soluble properties for nickel and iron hydroxides.
3. Voltage at which plating is carried on.

Sludge formation can be entirely eliminated by high acidity, but as this condition is conducive to imperfect deposits and poor cathode efficiency, it is not to be recommended. But as high an acidity should be maintained as will still give satisfactory deposits, and high cathode efficiency. The most approved method of decreasing the amount of sludge formation is through the use of citrate salts. It has been noted that those solutions operated at a low voltage (1½-2 volts) seem to accumulate more rapidly than those operated at 3-4 volts. This statement, however, has not met with unanimous approval. In the analysis of many sediments from stationary nickel solutions, the following have always been found to be present: carbon, silicon dioxide, copper, tin, iron, aluminum, nickel, zinc, and magnesium salts.

It has been observed that nickel anodes when in operation may be coated with either a yellowish green scum, or a black scale. The nature of the black scale has been a matter of much controversy. By many it has been claimed to be carbon, but it has been easily proven to be black nickel oxide intermingled with fine metallic nickel. The black scale has been found to form most readily in solutions of high acidity and operated with a high current density, while the yellowish scum has been found to form on anodes when the acidity is low, and when operated with a low current density.

ANODE AND CATHODE EFFICIENCY

Faraday's law states that the amount of chemical change that takes place at the anode and cathode is proportional to the strength of the current, the time, and the chemical equivalent of the metal or element concerned; 26.8 ampere-hours being required to deposit at the cathode or dissolve from the anode a gram-equivalent of any substance. Faraday's law does not state that one gram equivalent of metal is deposited for every 26.8 ampere-hours that pass through the solution, but only that there is a total chemical change equal to one gram equivalent at both the anode and the cathode. The plater has to determine whether one or several substances are evolved that make up this total.

By current efficiency is meant the per cent metal actually deposited or dissolved of that calculated by Faraday's law, assuming that all the current has been spent in depositing or dissolving metal. In nickel plating solutions there is more or less hydrogen evolved at the cathode, of no value to the plater. Hence it is of value to the plater to know the efficiency of deposition, or anode solution of the bath he is using, or what percentage of metal is deposited at the cathode and dissolved from the anode of the current being consumed. If nothing but metal were deposited, and this deposition of metal were exactly replaced by the metal dissolving from the anode, we would have 100 per cent cathode and anode efficiency. To find the efficiency of the anode and cathode it is only necessary to weigh the electrodes, electrolyze, keep a record of the time and current with instruments of guaranteed accuracy and then weigh again. If we divide the change in weight by the amount of change that should have taken place according to Faraday's law, the quotient multiplied by 100 will be the current efficiency. The efficiency of nickel solutions at the cathode is never 100 per cent due to a portion of the current spent in depositing hydrogen gas, or in producing some other chemical change other than depositing metal.

There are in existence many formulas for depositing nickel, from which satisfactory deposits are obtained. These formulas vary in a great many respects, so

that it is not necessary for good results that fixed amounts of chemicals be used, or that they be in a definite proportion to each other. However there are limits within which the ingredients of a solution depositing metal should lie, and when a solution has been made up that gives satisfactory results it is essential to keep the composition unchanged. To do this, it is not necessary that the current efficiency be 100 per cent at the anode and cathode, but only that they be equal; that metal be dissolved from anode mean amount equal to that deposited at the cathode. If the cathode efficiency is greater than the efficiency at the anode, metal is removed from the solution faster than it is supplied, and the solution becomes weak in metal. Should this continue for a considerable period of time, the solution will become so depleted of metal that burning of the deposit will result. Besides decreasing the metal content, this inequality of anode and cathode efficiency causes an increase in concentration of acid. Should the efficiency of the anode exceed that of the cathode, the solution increases in metal content and decreases in acidity; this condition if continued will eventually result in a dark deposit.

The nickel solution, as do all plating solutions, tends to be self-regulating in the matter of current efficiency, because if the anode efficiency is less than the efficiency at the cathode, the free acid formed will in time reduce the cathode efficiency, and increase the efficiency of anode corrosion. It is evident that in time, the efficiency of the anode and cathode will become equal, provided the nickel anodes are readily soluble. But practically, plating solutions cannot be left to correct themselves in this respect.

A general principle applying to efficiency at the anode is that increase of current density tends to lower the current efficiency, and lowering the current density raises the current efficiency, if it is not already 100 per cent. Because of the desirability of having a certain current density upon the objects being plated, it is often not practical to change the current flowing through the bath, so that a change in current density at the anodes must be sought through a change in the area of the anode surface exposed. In nickel solutions 2 to 2½ times the anode surface to cathode surface is not excessive. Another method of obtaining the amount of anode surface to be exposed to the solution is to add anodes until the current density is reduced to 5 amperes per square foot upon the anodes. At this current density, it is said that an anode current efficiency of 90 per cent or more can be obtained.

When nickel solutions lose their desirable acidity, it is because the efficiency at the anode exceeds that at the cathode, and metal is dissolved faster than deposited. The remedy is to raise the current density at the anode, which is done by removing a sufficient number of anodes. If on the other hand the nickel solution becomes acid in continual use, the current efficiency at the anode is less than at the cathode, and the current density at the anode should be lowered by adding more anodes. Since the corrodibility of nickel anodes varies greatly, a condition might exist that with all the anodes the tank will hold, there is still a production of acid. The only remedy then is to increase the corrosive power of the solution by the addition of chlorides, or change to anodes that are more easily soluble.

NORMAL DEPOSITION

In two or three minutes, objects being nickel plated, should be completely covered with nickel. Gas evolution should be very slight and noticeable only upon close scrutiny. If in this period of time, the objects show no deposit, or only a discolored deposit, the current is either too weak, or there is a short circuit in the tank which will be indicated by volt meter at zero. Ammeter will continue to give a reading.

Should gas evolution appear violent, and the deposit in two or three minutes take on a dull grey appearance, the current is too strong. At the start of deposition, especially upon iron and steel, the deposition should be started with a higher current density than has been found advisable to plate for a definite time. In this manner, less porous deposits are obtained, and iron and steel articles will be found to develop rust speckles less readily. The current is then reduced to the critical current density, and allowed to plate for its predetermined time.

How thick nickel deposits should be is a matter of opinion. Some manufacturers deposit only enough to be color buffed, immaterial of the service which the articles are asked to give. That objects plated should be given a plate depending upon the service they are to undergo, cannot be questioned. However no standards have been established, so that this matter is at present a matter of individual opinion. The general opinion is that nickel deposits are not over .0002 in. thick, and most of them considerably less.

COMPOSITION OF NICKEL DEPOSITS

It is well known to platers that the composition of the deposit from nickel solutions is not pure nickel. It is more or less a nickel-iron-hydrogen alloy. The part played by iron in the deposit has been frequently a point of dispute. By some, it has been maintained that iron in a nickel deposit causes the deposit to rust, that is that the nickel deposit will show blotches or small speckles of rust. This view can hardly be held as tenable, until it is conclusively shown that nickel deposits containing iron, deposited upon brass will show a similar appearance. It is more strongly to be believed that the rust spots attributed to the presence of iron in the deposit, are caused by a porous deposit. When iron is in a nickel deposit, it is known to be appreciably hardened, so that it is possible to buff it much more easily to a higher color, than when a purer or softer nickel has been deposited.

This article will be continued in an early issue.—Ed.

Stripping Enamel

The method is to use a steel tank suitably heated with steam coils, so that a temperature of 180° Fahr. can be obtained. The positive or anode current is made direct to the tank. The negative or work pole should be thoroughly insulated from the tank by the use of porcelain or hard rubber supports.

The solution consists of:

Water	1 gallon
Caustic Soda	6 ounces
Soda Ash	4 "

A very strong current at not less than 6 volts should be used; more if possible. The enamel is removed by hydrogen evolution, which gets under the japan or enamel and practically blows it off.

If the electric current is not available then use a boiling solution or nearly so composed as follows:

Water	1 gallon
Caustic Soda	6 ounces
Soda Ash	3 "
Trisodium Phosphate	3 "

Immerse the japanned or enameled steel parts in the solution until dissolved.—C. H. Proctor.

Stripping

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Stripping Silver

In my opinion, the best strip for removing silver or nickel from antimonial lead is an electro strip prepared from 9 parts sulphuric acid and 1 part water; to every gallon of strip so prepared add 1 oz. glycerin. A reversed current is used in connection with the strip at not less than 6 volts. The articles to be stripped become the anodes. The cathodes should be of fairly heavy sheet copper and should be so arranged that they completely encircle the articles to be stripped. If the solution is slightly agitated or the articles to be stripped are mechanically agitated, the stripping will proceed with greater rapidity.

Stripping Nickel

Q. We have been following the policy of polishing off the nickel plate on nickel stove castings. We, however, found that following this procedure is very costly. If you can acquaint us with any compound or procedure which will permit us to clean off the old nickel plate on iron castings without the necessity of polishing them, we will appreciate hearing from you. We are under the impression that the nickel-platers of stove parts have some special process.

A. Of course, you cannot expect to eliminate polishing by the use of an electric strip to remove the old nickel from stove castings or from other metal surfaces.

The electro strip should be arranged so that the connections are just the reverse of ordinary electro-plating. The articles to be stripped become the anodes. The cathode consists of fairly heavy sheet copper, which should entirely surround the stripping tank so that the nickel will be reduced uniformly.

The formula for the strip is as follows:

Water	1	pint
Sulphuric Acid	1½	gallons
Glycerine	1	ounce

Use 6 volts and as high an amperage as you can conveniently carry. As soon as the nickel is stripped wash the articles in cold water very thoroughly; then in boiling water containing one ounce of soda ash per gallon. The soda ash will neutralize the acid in the pores of the metal.

When in use the strip should be covered as tightly as possible. Sulphuric acid absorbs moisture from the atmosphere constantly, so that there is no necessity of adding water, but your tank may overflow if not covered to avoid absorption of moisture.

Stripping Gold

Q. How can I strip gold from church goods before replating?

A. The following formula should give the desired electro strip for gold:

Water	1 gallon Temp. 180° F. at 6 volts.
Sodium Cyanide	8 ozs.
Rochelle Salts	2 ozs.
Ammonium Phosphate	1 oz.

Use a reverse current. The articles to be stripped become the anodes; either carbon or steel can be used as the cathodes. Zinc shavings will precipitate the gold out of any cyanide solution by depositing on the zinc. When the gold is all precipitated, remove, wash carefully and dissolve the zinc from the gold by a solution of muriatic acid either diluted or undiluted. The gold will remain in spangles of metallic gold which may be filtered from the solution and then be reconverted to chloride of gold or melted when in sufficient quantities into metal ingots or buttons.

Electro-Plating with Chromium

The deposition of chromium on metals by electro-plating is exciting some interest in Great Britain and the subject is under investigation at some of the Sheffield works. Some doubt is felt as to the commercial possibilities of the process. Chromium is four times as costly as nickel but that would not be a serious factor provided the operation of plating does not prove to be more expensive. Chromium is said to give a much more durable surface and there is said to be a substantial saving in time and labor, as plating with chromium occupies only one-third of the time taken for the deposit of nickel and the articles come out of the solution in a highly polished state. Lead anodes can be used and these do not deteriorate in the solution. It is asserted that an ample coating of chromium can be deposited on brass in two minutes and that as the copper does not penetrate the chrome there is no necessity for subsequent buffing. The chromium, it is claimed, is also so worked into the base metal that rust cannot settle between the two.

Apparently the process with which experiments are being made is based upon a patent taken out by Erik Liebreich of Joachim-Friedrichstrasse 51 Berlin-Halensee in Germany on March 8, 1920, and in England on December 9, 1921. Reference to the process is made in the German "Zeitschrift" of September, 1922 (Vol. XIV). The specification deposited in the English Patent Office bears the number 159,887 and its subject is thus described: "This invention relates to improvements in the process of electrolytically separating metallic chromium from chromium compounds. According to my invention, I use bi-equivalent and ter-equivalent oxides of chromium in aqueous solution, without the presence of chromic acid, and chromates, or with only trivial quantities thereof present. The aqueous solution of the said oxides is colloidal. The deposits of chromium thus obtained adhere very firmly and in every respect meet all the technical requirements of electro-plating."

The claims set out by the inventor after giving the details of his specification are (1) The process of electrolytically separating chromium from a colloidal, or partially colloidal, aqueous solution of bi-equivalent and ter-equivalent oxides of chromium, such solutions being free from chromic acid and chromates or containing only trivial quantities thereof. (2) In the process claimed in Claim 1, using a solution of oxides obtained by the electrolysis of chromic acid or chromates, prior to the deposition of the metal. (3) The process according to Claim 1 performed with ter-equivalent chromium salts added to the electrolyte. (4) The process according to Claim 1 performed with the electrolyte weakly acidulated, preferably by means of boracic acid.—G.

The Marine Show

The annual exhibit of marine equipment was held in Grand Central Palace, New York, November 5-9, 1923. A large variety of equipment was shown and the exhibit was of considerable interest to metal manufacturers in that so many of the appliances shown used metals and alloys. It is safe to say that if there is any one place in which non-ferrous metals are indispensable, it is in marine equipment.

The exhibits of metal manufacturers were confined to American Brass Company and the Scovill Manufacturing Company both of Waterbury, Conn. These companies showed unusually large and attractive lines of metals and their fabricated forms. Their exhibits were indicative of the high state of perfection which the art of metal fabrication has reached.

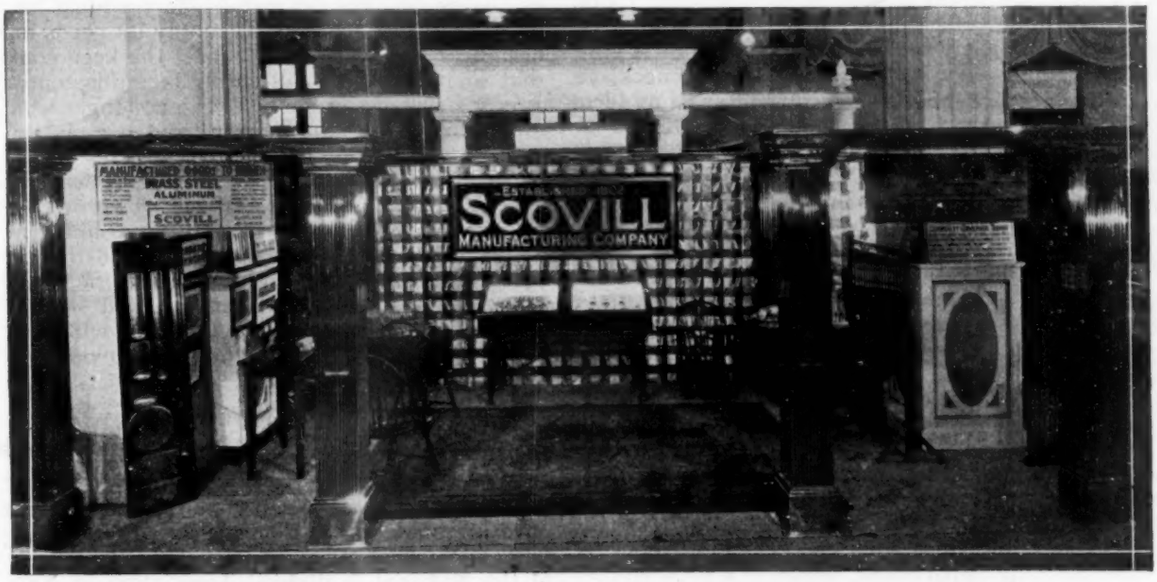


EXHIBIT OF SCOVILL MANUFACTURING COMPANY AT MARINE EXHIBITION

The firms whose products showed a large proportion of metals were as follows:

Akimoff Propeller Company, Philadelphia, Pa. Marine propellers.

American Brass Company, Waterbury, Conn. Brass, bronze and other metal products of all kinds.

Ashton Valve Company, Cambridge, Mass. Ammonia relief valves.

Babcock & Wilcox Company, New York. Marine steam boilers and mechanical atomizing oil burners.

Bethlehem Ship Building Corporation, Ltd., Bethlehem, Pa. Dahl mechanical oil burning system for marine, power plant and industrial purposes.

Brown Instrument Company, Philadelphia, Pa. Pyrometers and thermometers.

Coen Company, Inc., San Francisco, Calif. Low pressure mechanical oil burning equipment for marine, power and industrial use.

Crane Packing Company, Chicago, Ill. Flexible metallic packing.

Crane Company, Chicago, Ill. Valves of all descriptions.

Wm. Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa. Propellers, engines and brass and bronze products.

Davis Engineering Corporation, Elizabeth, N. J. Feedwater heaters and other power appliances.

General Electric Company, Schenectady, N. Y. Electrical equipment of all descriptions for marine purposes.

Ingersoll Rand Company, New York. Oil and gas engines.

Lunkenheimer Company, Cincinnati, Ohio. Valves of all descriptions.

Morse Dry Dock and Repair Company, New York. Oil burning equipment.

National Meter Company, New York. Oil meters and water meters.

New London Ship & Engine Company, New London, Conn. Marine engines.

Pioneer Company, New York. Packing metal.

Radio Corporation of America, New York. Radio apparatus of all sorts.

Scovill Manufacturing Company, Waterbury, Conn. Brass, bronze and other metal products of all kinds.

Sperry Gyroscope Company, Brooklyn, N. Y. Marine equipment and appliances, such as compasses, stabilizers, searchlights, indicators, etc.

Submarine Signal Company, Boston, Mass. Oscillators, bells, etc.

Sun Shipbuilding Company, Chester, Pa. Marine engines.

Todd Ship Yards Corporation, New York. Oil burning systems and equipment.

U. S. Bureau of Navigation. Marine equipment.

U. S. Coast and Geodetic Survey. Coastal mapping.

U. S. Lighthouse Service. Lighthouse and signal equipment.

U. S. Navy. Naval equipment.

U. S. Public Health Service. Medical, surgical and operating equipment of all sorts.

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Electrical equipment of all descriptions for marine purposes.

Worthington Pump and Machinery Corporation, New York. Pumps and engines.

A Visit to the Rhode Island School of Design

Written for The Metal Industry by A. F. SAUNDERS, Designer

A short time ago I had the privilege of a visit to the Rhode Island School of Design in Providence, R. I. I had heard a lot about this fine institution but it requires a visit to appreciate fully the valuable work that is being accomplished by Director Rose and his staff of very capable assistants, every one of whom is a practical and experienced man in his particular field of instruction. The healthy development of this school from its small beginning back in 1878 to its present size and important position in the art metal industry of New England, is evidence of the sound basis upon which it was founded and is conducted.

My visit to the school started in the designing room, the very beginning of things. For whether a silver spoon or a complete dinner service, a simple little gold and enameled brooch, or a sumptuous jeweled necklace is to be made, there must be the conception of an idea, and the mind through the eye and hand trained to delineate the idea in an artistic and practical manner. Thus everything begins with the design. No amount of skillful craftsmanship can cover up poor designing, and it is equally true that the most perfectly conceived design may be ruined by poor workmanship.

Under the guidance of Colin D. Barrett, a practical designer of many years' experience, the students are taught free hand drawing, ornamental design and the theory of color. This part of the course is supplemented by a thorough training in modeling, both in wax and clay; also pattern making in plaster. Modeling gives the student an excellent idea of how his designs appear when worked up in the round or relief. Repeated trials and changes may be made in a short time, resulting in fewer errors in the final work when executed in metal.

It was but a few steps from the designing room to the silversmithing department, which is a fully equipped shop. Here under ideal working conditions instruction is given the students in every phase of the silversmith's art, including smithing, spinning, soldering and filing, saw-piercing, engraving and repoussé chasing; also finishing, coloring and plating. Die and hub cutting are taught in a room of their own, and some of the examples of die work that was shown me by Mr. Heath, the instructor, were certainly a credit to the class and its capable teacher.

The jewelry working room is another completely equipped shop on a small scale, and every detail of the jeweler's art is taught, from the simple operation of drawing wire to the skillful manipulation of enamels. A separate room is devoted to instruction in lapidary, the cutting and setting of gems. This class was not at work during my visit, but a good idea of its excellence could be gained from the examples of the student work on show in the exhibition room, which contains a very comprehensive collection of the work of the school as a whole.

The school has a good library where the students are taken from time to time and taught how to use the books and photographs. It is an important part of an art student's education, to learn how to gather ideas from what he sees and reads, and to differentiate between mere copying (which requires no brains), or using what he sees and reads as an inspiration and starting point for his own line of thought.

Some of the young men are part time students, that is they are entered for a three year course, three days a week from 9.00 A. M. to 1.00 P. M. Some concerns, not being able to send apprentices during the day, enter them in the evening course of about six hours per week.

The New England Manufacturing Jewelers & Silversmiths Association has given the school its most hearty support for some years past. Also several of the manufacturers show their interest by offering money prizes for monthly competitions in jewelry design, which has created a lively interest among the students.

It is to just such schools as the Rhode Island School of Design that the art metal industry must largely depend for future material to supply its needs in trained designers and craftsmen to meet the keen competition that sooner or later will surely face this country from a reconstructed Europe. We can no longer look abroad for trained artists and workers, and as a matter of fact, why should we? The material is here. All it needs is to interest and train it in the right way, and then take care of it after it is trained. Two or three more such schools in different parts of the country would be of great benefit to the art metal industry; not only the jewelry and silver end of it (but practically every branch of the industry where art and skilled craftsmanship enter into the product. It will well repay any one interested in art metal work to visit the Rhode Island School of Design.

National Founders' Association Meeting

William H. Barr, president of the National Founders' Association and of the Lumen Bearing Company of Buffalo, N. Y., delivered an address at the annual convention of the National Founders' Association in New York, November 21, 1923. Following are excerpts from his speech:

"That extravagant building costs directly governing ever-increasing rentals are brought about by the brigandage of the building trade unions is recognized by all and denied by none," he asserted. "Apparently the only answer to this problem is the absolute necessity for the adoption of the 'open shop' policy of employment in this troubled industry.

"Will Congress reduce our taxes? The answer is 'yes,' provided there is no bonus legislation, and if there is an observance of the strict economy in governmental operation which President Coolidge and the Cabinet are urging."

The present tendency to legislate rather than to enforce is painfully apparent. Many public officials seem to believe that a new law is more desirable than an earnest effort to enforce an old one. How will any man keep up with ten thousand new laws annually? Why not have a breathing space in this kind of legislation? Every time a public official desires a new law there should be an inquiry to discover whether or not there are existing laws covering the point he has in mind and, if possible, to check the inspiration of his demand.

The farmer therefore has a natural alliance with the manufacturer who with him is striving for lower costs by combatting artificial union labor prices and restricted production.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

Published Monthly—Member of Audit Bureau of Circulation

Copyright 1923 by THE METAL INDUSTRY PUBLISHING COMPANY (Incorporated)

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year :: SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

ADVERTISING RATES ON APPLICATION. FORMS CLOSE THE FIRST OF THE MONTH

Palmer H. Langdon .....Editor and Publisher
Adolph Bregman .....Managing Editor
George W. Cooper .....Advertising Manager
Thomas A. Trumbour .....Business Manager

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number Beekman 0404. Cable Address, Metalustry

Vol. 21 New York, December, 1923 No. 12

Contents

The Aeromarine All-Metal Hull Flying Boat.... 471
A Description of the Latest Development in Aircraft Construction. All-Metal Flying Boat Made Possible by Aluminum.
By PAUL G. ZIMMERMAN

Some Impressions of American Non-Ferrous Metallurgy 473
A Report of a Lecture to the London Section of the Institute of Metals, Delivered on November 8, 1923.
By DR. W. ROSENHAIN

Fine Wire..... 473

A List of Alloys..... 474
Reprinted from the Booklet Published by the American Society for Testing Materials. Part 6.
By WILLIAM CAMPBELL

Graphites for Brass-Melting Crucibles..... 477
Experiments on the Value of American Graphite as Compared with the Imported Material.
By R. T. STULL and L. E. GEYER

Vaporized Metal Sprayed by Hot Blast..... 478

Red Stains on Sheet Brass..... 479
A Discussion of the Causes and Methods of Prevention and Removal.
By E. A. BOLTON

Prevention of Corrosion of Steel..... 483

Survey of Nickel Solutions..... 484
To Bring Out in an Orderly Fashion, Much of the Data on Nickel Solutions Scattered Throughout Various Sources That Will Be of Value to the Electro Plater and to Refute Some Statements Are the Purposes of This Article—Part 6.
By JOSEPH HAAS, JR.

Stripping Enamel 487
By C. H. PROCTOR

Stripping 488
By CHARLES H. PROCTOR

Electro-Plating With Chromium..... 488

The Marine Show..... 489

A Visit to the Rhode Island School of Design..... 490
By A. E. SAUNDERS

National Founders' Association Meeting..... 490

Editorials 492
Reduced Taxes—Increased Business
All-Metal Airplanes
Wider Uses for Silver
Connecticut vs. Wales
Sixty Years in the Brass Industry
Our January Number

Technical Publications..... 493

Correspondence and Discussion..... 494

New Books..... 495

Shop Problems..... 496

Patents 498

Equipment 499
Making Metal Patterns by Electro Deposition
Meaker Washing Machine
Nickel Salts
Floor and Bench Grinders
An Almost Unbreakable Lamp
One-Piece Foundry Furnace Linings
Scrap Bundling Machine

Associations and Societies..... 502

Personals 503

Deaths 503

News of the Industry..... 504

Review of the Wrought Metal Business..... 509

Metal Market Review..... 509

Metal Prices..... 510

Supply Prices..... 512

Index 513

EDITORIAL

REDUCED TAXES—INCREASED BUSINESS

One of the most heartening and impressive indications of good times ahead is the letter written by Secretary of the Treasury Mellon to the Honorable W. R. Green, Acting Chairman of the Committee on Ways and Means in the House of Representatives at Washington, D. C. Secretary Mellon's letter gives a comprehensive program for the Committee on Ways and Means, in laying out its coming tax schedule.

It seems that in 1922 and 1923 there has been a surplus of about 310 million dollars each year, over and above expenditures. The result is that the Government has found itself solid, with a balanced budget each year and a surplus to provide for reducing debt. Secretary Mellon credits this achievement to the budget system and the united effort of the department heads in the administration. For this reason it seemed to him advisable to recommend reductions in the taxes to go along with further reductions in public expenditures. Secretary Mellon states that the outlook for the next four or five years is that there will be a surplus of about 300 million dollars a year and that for this reason a reduction in taxes should be put into effect. The Secretary goes on to make the following recommendations.

1. Make a 25 per cent reduction in the tax on earned income, earned income being that derived from wages, salaries and professional service as against business or investments.
2. Reduce the present normal tax from 4 to 3 per cent and from 8 to 6 per cent. This will effect the lower incomes.
3. Reduce the surtax rates by commencing their application on $10,000 instead of $6,000, and scaling them progressively upwards to 25 per cent at $100,000. The Secretary states that in the long run this will mean a higher rather than a lower revenue from surtaxes because their productivity is at present steadily shrinking, due to the tendency of taxpayers to invest in tax-exempt securities rather than productive business. He believes that the reduction of these taxes will bring more capital into business and further increase the yield.
4. Repeal the tax on telegrams, telephones and leased wires.
5. Repeal the tax on admissions.
6. Repeal the nuisance taxes.

In addition, the Secretary recommends making certain changes in adjustments and allowances for capital losses, interest paid, etc., which will add to the revenue of the Government; thus offsetting, to a certain extent, losses entailed by the above changes. According to the Treasury Department estimates, the adoption of the above recommendations will result in a net loss of about 323 million dollars per year. It is stated that the benefits of reduction will be distributed among all classes of taxpayers and the revision generally will help to free business and industry of vexatious interference, and encourage in all lines a more healthy development of productive enterprise.

Business men as a whole are agreed with Secretary Mellon that the present burden of taxation is heavy. The storm of applause which followed the publication of his letter in the daily press proves that the sentiment of the business public is with him. It is generally felt that the Secretary is completely right in stating that the revenues of the Government as sufficient to justify substantial reductions and the people of the country should receive the benefits. A large surplus is a temptation to wastefulness, particularly at the present time when such determined efforts are being made to force heavy expenditures in a number of new directions.

ALL-METAL AIRPLANES

The leading article in this issue, the All-Metal Hull Flying Boat, shows strikingly the manner in which metals have forged ahead in replacing other materials for construction purposes. At one time metal was comparatively restricted in general use; then steel came in and showed the possibilities for buildings, ships and other construction. In a comparatively short time, other metals began to claim their rights and to assume work for which steel was unfitted. What has, by some, been called the Alloy Age followed, and is now with us. The field of possible combinations of metals is so large and the properties discoverable so varied that the end seems nowhere in sight.

Aluminum was one of the latest discoveries and its growth has been one of the industrial romances of the last two decades. It has taken its place in one field after another where its light weight and comparatively high sterngth were of advantage. The airplane industry searching for just such a combination has found it the ideal material for permanency, strength and protection against breakage and splintering, to which wood is subject. Aluminum has been eminently satisfactory. Now at last we have an airplane made of this metal.

It should be borne in mind that this is a benefit not only to the producers of aluminum but to the large number of industries directly and indirectly connected with the metal working field; more metal working machinery is necessary and more men employed.

To be sure this development is still small, so far as actual tonnage is concerned, but with the undoubted growth of flying, it bids fair to take its place as one of the important outlets for light metal and a large source of revenue to casting and metal working plants.

WIDER USES FOR SILVER

A few weeks ago Secretary of the Interior Work communicated with the Bureau of Mines asking for a preliminary report to see whether a definite research was warranted on the question of increased uses for silver in commerce and industry. The general object was to find out if it was possible to offset the decrease in its demand for monetary purposes, due to the expiration of the Pittman Act, which enabled American producers to sell to the U. S. Government about 208,000,000 ounces at $1 per ounce. Shortly afterward the Bureau of Mines submitted this preliminary report, stating that a systematic study of silver and its alloys should result in its wider use in at least two fields with strong probabilities of similar results in other directions. These two fields were the development of a non-tarnishing silver for tableware and the arts, and finding silver alloys suitable for trimming automobiles.

Silver has simply been allowed to take up those fields in which it was found suitable, and no systematic research or development work has ever been done. The report states that although individual producers and fabricators have not overlooked the possibilities of such study, it is believed that under Governmental direction these investigations could be co-ordinated into a systematic plan of research which would increase the commercial and industrial use of silver.

New alloys offer a wide opening. Small percentages of other metals might offset the character of the silver greatly. If a tarnish preventive could be developed, a greatly increased market could be obtained. It is already known that cadmium reduces the susceptibilities to tarnish. This, however, is simply one possible opening. The chance for developing comparatively cheap silver alloys opens up many interesting possibilities. In conection with this is mentioned silver-aluminum.

The report of the Bureau of Mines has been submitted to Senator Oddie, Chairman of the Senate Commission on Gold and Silver Inquiry, requesting an opinion from the Commission as to whether the public interest would warrant the Interior Department undertaking the co-ordination of individual investigations and the beginning of a systematic study of new uses for silver.

CONNECTICUT vs. WALES

On page 494 of this issue will be found a letter from Mr. Lawrence A. Walsh defending Waterbury as the Brass City of the world against Wales, as a brass producing district. Mr. Walsh takes Mr. Smith to task for criticizing the American methods of melting metal. He holds that electric furnaces, which have become such an important factor in the rolling mill field, have put out completely crucibles and pit fires.

Far be it from us to judge between two such important brass producing districts. Both are eminent and need no praise to add to their stature. In the interests of accuracy, however, we suggest that even our own Connecticut champions should be somewhat careful with their figures. In the first place, Waterbury does not produce overe 50 per cent of the brass of the United States. According to the U. S. Census Bureau, Connecticut produces 35 per cent and Waterbury, therefore, considerably less, although a very respectable percentage nevertheless. Moreover, according to the Census of 1919 Waterbury's wage earners engaged in manufacturing totaled 30,322. Supposing for the moment that every single one of these is engaged in the manufacture of brass (which is rather unlikely) this figure would total only about 32 per cent of its population instead of 40, as claimed.

As for the rest, Waterbury certainly has some advantages. The fact that nobody under sixteen is permitted to work in the mills, is a very good thing. The fact that electric furnaces are displacing pit fires shows decided progress. It is also true that over 40,000 different articles are produced in the cutting-up shops and manufacturing plants. Its total output and breadth of market, we believe, have entitled Waterbury to the name—Brass City of the World, but the right to this title will not be increased, nor will Waterbury's fame be spread any further, by exaggerating the facts.

SIXTY YEARS IN THE BRASS INDUSTRY

The death of James Samuel Elton, noted on page 503 of this issue, brings to mind another industrial captain in the ranks of the brass industry, who helped to build it up with over a half a century of effort. Mr. Elton, who began with the Waterbury Brass Company in 1863 and remained with it through its merger with the American Brass Company, holding the position of director of the combined organization, lived to see little shops develop into enormous plants and small stores grow to nation wide selling organizations.

Like most of the Naugatuck Valley leaders, Mr. Elton was averse to publicity, and his sixty years of service were, therefore, unannounced until now. None the less, his work speaks for itself. He, together with the other pioneers, nursed the brass industry as an infant through its difficult periods and helped it to become one of the important sources of national wealth.

OUR JANUARY NUMBER

We herewith advise our readers that our January issue, which is an Annual Review Number, will be issued, as usual, about the middle of the month.

Technical Publications

JOURNAL OF SCIENTIFIC INSTRUMENTS

The purpose of the Journal is to describe methods of measurement and the construction and use of instruments used in all branches of scientific and technical work. This is the first publication of its kind in England and the favorable reception accorded to a preliminary number issued last year leads to the belief that it will have real value as an aid to research and manufacture. The Journal will be published on the 15th of each month at 2/6 a number and the annual subscription is 30/- post free. Copies may be obtained from the Institute of Physics, 10 Essex Street, London, W. C. 2, England.

LIGHTING DATA

Those interested in the following can obtain copies by communicating with the Department of Publicity, Edison Lamp Works, Harrison, N. J.:

Bulletin L. D. 150, Re Lighting of Steel Mills and Foundries.
Bulletin L. D. 148, Lighting Legislation.
Bulletin L. D. 147, Lighting for Traffic Control.
Bulletin L. D. 149, Mazda Lamps in Photography.
Bulletin L. D. 132, Lighting of Large Dry Goods and Department Stores.
Bulletin L. D. 103-B, The Lighting of Show Windows and Show Cases.

HISTORY OF ELECTRIC LIGHT

By Henry Schroeder

This publication is Number 2, Volume 76 of Smithsonian Miscellaneous Collections, published by the Smithsonian Institute, Washington, D. C. It covers the subject from the earliest electrical discoveries which were in any way connected with electric lighting, up to the present day.

ALUMINUM PAINT

By Junius D. Edwards

A treatise on the physical properties of aluminum paint and its uses in modern industry. The author, who is assistant director of research for the Aluminum Company of America, covers the composition, characteristics, special properties and uses of aluminum paint.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

NICKEL ITCH

To the Editor of THE METAL INDUSTRY:

In response to your editorial in the October issue we are very glad to give you the report of our foreman plater, Mr. H. M. Dawson, a member of the Bridgeport branch of the American Electro-Platers' Society.

We understand that you will forward the information to the Boston branch.

BRIDGEPORT BRASS COMPANY,
JOHN L. CHRISTIE, Metallurgist.

Bridgeport, Conn., November 7, 1923.

SUBJECT:—Platers and the Nickel Itch.
TO: Mr. Christie, Metallurgist.

The writer submits the following answers to the questions asked by the committee appointed from the Boston branch of the American Electro-Platers' Society to investigate the nickel itch. These questions appeared in the October issue of THE METAL INDUSTRY, 1923.

1. Do you know of a case of itch or rash among men working over a sulphuric or hydrochloric acid pickle?

Answer—No.

2. Do you know of a case of itch or rash resembling nickel itch, contracted by a man working in or around a plating room, but not over the nickel baths?

Answer—Yes.

3. What type of men in your experience contract nickel itch?

Answer—Light or sandy complexion.

4. What treatments for nickel itch do you know of?

Answer—Stop using sodium chloride, use nickel chloride instead.

Wash with carbolic soap, dry thoroughly and bathe with pure glycerin.

In my experience, I had only one man who did not recover after we stopped using sodium chloride. This was the same man who developed that which looked like nickel itch when he was not working over solutions.

THE METAL INDUSTRY has asked to have the replies to the above questions sent to them, and they will pass them on to Mr. Herrick, one of the committee.

H. W. DAWSON,
Foreman Plater,
Bridgeport Brass Company.

(Member of the Bridgeport Branch, Conn., American Electro-Platers' Society.)

J. L. Christie, November 1, 1923.

TO THE EDITOR OF THE METAL INDUSTRY:

Noting an article on the "nickel itch" in a recent issue of your publication and a request for remedies for same, I am submitting the following experience:

My skin seems to be more sensitive to chemical action than that of the average individual. Not only do plating room fumes of an irritating nature, but various oils, etc., as well, act in a similar manner. Kerosene, distillate, turpentine (the latter especially), produce a rash that is terribly irritating but is easily cured when the cause is removed.

At one time my entire body from the waist up was in a bad state from wearing, during working hours, working clothes that were hung up in the plating room at night, (no ventilation being allowed after closing time). After several sleepless nights, meanwhile trying several remedies with no results, the family doctor was consulted. His first suggestion was a wash of a solution of carbolic acid and water. On being informed that that had been tried with no results, his next suggestion was applying a solution of a tablespoonful of borax in a pint of warm water and putting on a freshly sterilized undershirt every morning. This treatment soon brought results. The rash soon subsided but left the skin hard and with a tendency to crack. However, the skin soon returned to normal after discontinuing the borax treatment. There was no loss of time from work.

Where the irritation may be confined to the hands, I have found the following to be the best treatment after trying about everything imaginable: After washing with some mild soap, and rinsing, immerse the hands in water as hot as can be borne to which has been added about a tablespoonful or a little more, of peroxide of hydrogen. Let the hands remain in this solution for five minutes, then after drying with a soft towel while the hands are still moist, apply oxide of zinc in powder form.

All liniments so far tried, only make matters worse. Vaseline or salves increase the itching. The only salve so far tried that has proved of benefit is "Resinol" salve. Its beneficial action seems to be due to the pine tar in its composition.

In my own case, the only part of my face affected is the folds of the eye-lids.

As a preventative measure, Resinol salve applied thinly is of considerable service. Stearate-of-zinc powder frequently applied is often used to prevent solutions and rinsing water, etc. from adhering to the skin, thereby causing the itching rash. That the rash cannot be wholly prevented, has been my experience.

People of the red or sandy type, seem to be affected the least of all. Some of them I have known have never been troubled in this manner.

Hoping that the above may be of benefit to someone, I wish to remain,

F. E. HOLBERT.

Oakland, Cal., November 7, 1923.

TO THE EDITOR OF THE METAL INDUSTRY:

I beg to advise that I have introduced the remedy for the nickel itch as recommended by Mr. C. H. Proctor into my plating room. It has been in use for two years and it is with great pleasure that I am able to state that since the introduction of the prevention and cure as laid down by Mr. Proctor, we have not had one single case of nickel itch or cyanide sores. Previous to my taking charge, there were always men (plating room help), in the local hospital with the itch and sores; as many as three and four at one time, and very bad cases at that. Upon inquiry I found that the majority of these men were employed in the ball burnishing and mechanical plating section of our plating department. I made it compulsory for all plating room help to use the prevention method and as a consequence, the cure for sores was not needed as there were no sores.

JAMES WELSBY,
Foreman Plater and Polisher,
Hotpoint Works Division of Canadian General Electric Company.
Stratford, Ontario, Canada, November 17, 1923.

CONNECTICUT vs. WALES

I have noted Mr. Charles A. Smith's letter on Welsh Rolling Mills in the October, 1923, number of THE METAL INDUSTRY. Mr. Smith claims that if the plants were put up right, there should be a stack for every ten pots and the men would turn out forty pots a day on each set of fires in about eight and one-half hours. He did not state what kind of metal. Even so, that doesn't matter. In a short while nobody (but an old-timer) will understand that way of working. Electric and oil furnaces have them out of the way already, by producing more. Mr. Smith also says boys at the age of fourteen years are taken into the mills and work their way up until they are roll men. In Waterbury mills, they have no light work for boys of that age; errand boy, perhaps, but he would have to be sixteen to hold that position. The roller on cold metal grinds his own rolls in the frames; they are not taken out to be ground on a lathe. Most of the time he grinds them in from one to two hours. Rolls that are used for round rods to be made into wire, and rolls that are turning out hot metal, such as wire, are taken out and ground on a lathe by a roll-grinder.

The rolling mills in Wales may send some metal around the

world, but Waterbury is the "Brass City of the World," also the home of the largest clock industry in the world. It is one of the great manufacturing centers of the United States. Approximately 40,000 of its 100,000 people being engaged in this pursuit. Anything and everything made of brass and copper can be obtained in Waterbury, the city's industries manufacturing over 50 per cent of the brass of the United States. One concern alone makes 40,000 different articles, many of which are exported. A mint for China has been produced. Foreign business has come to Waterbury without much effort on the part of its manufacturers, simply for the reason that it has the goods other countries need. Thank you.

LAWRENCE A. WALSH.

Waterbury, Conn., October 30, 1923.

New Books

Magnesium. Published by the American Magnesium Corporation, Niagara Falls, New York. Size 4½ x 7, 177 pages.

A handbook of information and data relating to the use of magnesium and magnesium alloys as they are made by the American Magnesium Corporation. It is stated that the presentation of this data is not offered as a technical thesis; primarily it is intended to meet the growing demand for information concerning a relatively new metal. In spite of this, however, the book contains more accurate technical, information for the user of this metal than probably any other work in existence. It begins with the background of magnesium covering its occurrence, history, manufacture and purity. It then goes on to describe the chemical properties and physical properties. Magnesium alloys are described and equilibrium diagrams given for binary alloys of magneisum with 19 other elements. Chapters follow on mechanical properties; commercial forms; methods of fabrication including casting, hot pressing, die casting, forging, spinning, drawing, riveting, machining, welding and soldering. Methods of surface finishing are described.

The uses are then taken up, and these are divided into two classes, chemical and structural. The book closes with a description of the methods of analysis for magnesium metal and a bibliography.

Cost Control for Foundries. By Everitt and Heywood. Published by McGraw-Hill Book Company. Size 6 x 9, 226 pages. Price, payable in advance, $3.00. For sale by THE METAL INDUSTRY.

The literature on cost keeping has grown enormously in the last decade, and although this is also true in the foundry industry, nevertheless it has lagged behind other more progressive businesses. For this reason, if no other, every work on this subject is welcomed, to say nothing of this one in particular, written as it is by men actually engaged in the work of installing and operating cost control methods in the foundry industry.

The book describes fully and in detail, the practice and routine of cost accounting for foundries. It is written simply and for the purpose of helping the man who is essentially a foundryman and not a cost accountant. It is understood that the average foundry cannot install or support complicated and expensive systems. What is needed is something simple, understandable and workable.

Aside from the technical details of keeping foundry books, this work covers such important topics as the analysis of labor costs; figuring the metal cost; getting the overhead into product; figuring the sales price. It is obvious that these topics cover the essential needs of every foundryman. If more of them could arrive at these figures correctly, there would be fewer failures and a much healthier condition in the industry.

Book of A. S. T. M. Tentative Standards. Size 6 x 9, 859 pages. Published by the American Society for Testing Materials, Philadelphia, Pa. Price payable in advance $7.00 in paper and $8.00 in cloth binding. For sale by THE METAL INDUSTRY.

This is the 1923 edition of the annual book of tentative standards issued by the Society. The volume contains 170 tentative standards. Those which relate to metals are as follows: Copper Trolley Wire; Soft Rectangular Copper Wire; Hot Rolled Copper Rods for Wire Drawing; Admiralty Condenser Tubes; Alloys for Railway Equipment; Babbitt Metal; Aluminum Ingots; Aluminum Sheet; Non-Ferrous Screen Cloth; Determination of Zinc in Pig Lead; Chemical Analysis of Aluminum and Its Light Alloys.

Technical Methods of Metallurgical Analysis. By Professor Wilfred W. Scott. Published by the D. Van Nostrand Company. Size 5¾ x 8¾, 890 pages. Price payable in advance $6.00. For sale by THE METAL INDUSTRY.

This is a manual of analytical methods and useful data for the chemist, metallurgist and college student.

In order to write a complete and thorough textbook the author has obtained the collaboration of a number of leading specialists in the metallurgical field and combined their knowledge with his own to produce an exhaustive and practical reference book. By this means, it is assured that each topic will be covered accurately and completely by one who is expert in that field.

The book offers a thorough discussion of the methods of analysis for aluminum, antimony, arsenic, barium, bismuth, boron, bromine, cadmium, calcium, carbon, cerium, chlorine, chromium, cobalt, copper, fluorine, glucinum (berillium), gold, hydrogen, iodine, iridum, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, nitrogen and the other elements.

Each of the above elements has a chapter to itself. Gravimetric Methods; Volumetric Methods; Industrial Products and Raw Materials are discussed and described. Coal, water and gas analyses are given; laboratory reagents and standard laboratory apparatus are recommended.

The A B C of Atoms. By Bertrand Russell. Published by E. P. Dutton & Company, New York. Size 5¼ x 7½, 162 pages. Price payable in advance $2.00. For sale by THE METAL INDUSTRY.

This is an introduction to the New Physics, by an author who is internationally known for his power of writing graphic and simple English, as well as for his scientific attainments. Metallurgists have been greatly concerned in the recent advances made in the knowledge of molecular structure. The work of the X-Ray specialist and the spectroscopist has advanced the science of metallography to a place where it has almost joined with the pure sciences. Practical metallurgists have, with good reason, up to now, been averse to dealing with speculative terms and abstract theories, but their work has been carried to a point where now it is necessary to accept certain seemingly nebulous assumptions in order to investigate the structure of metals and metallic alloys successfully.

The author, after an introductory chapter, covers the following: The Periodic Law; Electrons and Nuclei; the Hydrogen Spectrum; Possible States of the Hydrogen Atom; the Theory of Quanta; Refinements of the Hydrogen Spectrum; Rings of Electrons; X-Rays; Radio-Activity; The Structure of Nuclei; The New Physics and the Wave Theory of Light; The New Physics and Relativity; Appendix-Bohr's Theory of the Hydrogen Spectrum.

The book is written with the extraordinary simplicity and clarity, characteristic of Professor Russell.

Mineral Resources of the United States in 1920. By G. F. Loughlin. Published by U. S. Geological Survey, Washington, D. C.

This is the annual volume with the collected reports on the different minerals bound together. Those interested in raw materials have, of course, already received the individual pamphlets, but this bound volume will, undoubtedly, prove a convenient method of filing this information. The book can be obtained from the U. S. Geological Survey. Topics covered are: gold, silver, copper, lead, zinc, cadmium, magnesium, chromite, bauxite, aluminum, platinum, arsenic, bismuth selenium, tellurium, antimony, secondary metals, manganese, cobalt, molybdenum, nickel, tantalum, titanium, tungsten, radium, uranium vanadium and quicksilver.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical
{ WILLIAM J. REARDON, Foundry
PETER W. BLAIR, Mechanical
LOUIS J. KROM, Rolling Mill
CHARLES H. PROCTOR, Plating-Chemical
R. E. SEARCH, Exchange-Research

ALUMINUM SOLDER

Q.—Can you give us a formula for an aluminum solder?

A.—A mixture that is said to give satisfaction is one known as Richard's Formula consisting of:

Tin	29	parts
Zinc	11	"
Aluminum	1	"
Phosphor Tin	1	"

In reference to aluminum solder I would suggest you look up a report of a discussion on aluminum solder carried on by the Bureau of Standards with views of discovering the best. You will find this report in THE METAL INDUSTRY for November, 1918.—W. J. R., Problem 3,268.

ANNEALING CASTINGS

Q.—I have a man who wants me to anneal some castings from the following mixtures and in all the years I have been in the business I have never tried to anneal a brass or bronze casting.

Copper	80	Copper	77
Tin	10	Tin	8
Lead	10	Lead	15

A.—It is not uncommon to anneal brass castings especially on high tin castings; 18% tin is very brittle and when annealed in a furnace to a cherry red and quenched in water the casting can be used for a spring. In fact this is done in air brake work.

We do not know what effect annealing will have on your mixture, if any, unless quenched in water. By annealing is understood the heating of metal or alloys to a temperature so as to alter the molecular rearrangement and thus remove stress which may be set up in casting. We have no data just what effect annealing will have on your mixture. However, if your man wants them annealed I cannot see any difficulty in doing so. Heat to a cherry red and quench in water. It may improve the grain somewhat.—W. J. R., Problem 3,269.

CASTING COPPER

Q.—We are making casting copper ingots from scrap copper and while we obtain the required degree of purity, the face of our ingot is almost black instead of being a good red. We skim the metal clean in the furnace and have tried a charcoal cover in the pouring ladle, as well as skimming metal in the ladle. We have also varied the time of dumping ingots into the water but do not obtain any uniformly good results.

A.—To get the desired red color on copper ingots, first, it is necessary to use copper molds properly coated. These molds can be made very cheap, by getting a master ingot and rigging it up so as to press into a suitable mold filled with the required amount of molten copper. This makes a very nice smooth ingot and as they burn out can be remelted and you will find them much cheaper than iron ingot molds.

Second, the best looking grade of ingot is made by hand ladling the metal from the furnace and pouring in a copper mold set over a water trough so they can be easily dumped. Copper tapped in ladles and then poured in ingots are never satisfactory, as very often the pitch of the copper necessary to the looks and quality is lost in transferring the copper from the furnace to the ladle, then to the molds. In other words, all that is necessary to get good looking ingots of copper made from scrap copper is to melt your scrap in a reverbertory furnace, get copper to the proper pitch, use copper ingot molds properly coated, hand ladle the copper and dump in water as the ingots set.—W. J. R., Problem 3,270.

DURABLE COLOR FOR ALUMINUM

Q.—Can you give us a formula for changing the color of aluminum to black, brown and white or nearly so, or giving it a durable wearing finish other than enameling?

A.—We presume that you have no facilities to color your aluminum articles by electro methods, so we are going to suggest that you try out the following formulas to obtain a black color by simple immersion.

Muriatic acid	1 gallon
White powdered arsenic	10 ounces
Sulphate of iron	5 pounds
Water	1 gallon

Dissolve the arsenic in half the acid by the aid of heat, and then mix with the remaining acid. In the gallon of water, 160 Fahr., dissolve the sulphate of iron. Mix both solutions and use at normal to 160 degrees Fahr.

Water	1 gallon
Manganese nitrate	2 ounces

Use this solution under the same conditions as above. The aluminum, after blackening, should be lacquered or waxed to preserve the black color.—C. H. P., Problem 3,271.

ENAMEL ON SOAP HOLDER

Q.—Under separate cover we are sending you a cheap bathroom fixture for soap. We would like to know of a process which will enamel this fixture economically with a white enamel which will stay on permanently. We would also like to know what capacity spray would be required to enamel about 200 per day.

A.—To give a fairly good enameled finish upon the steel bathroom soap holders as submitted to us, it would be necessary to give two coats; first, a primary coat, which would be dull white, and second, a finishing coat of white enamel.

We would suggest that you get in touch with a spray manufacturing concern and a lacquer manufacturer. They would be willing to furnish samples for you, and give you an idea of the time and cost, and the tank capacity for spraying 200 articles a day.—C. H. P., Problem 3,272.

ENAMELED STAMPINGS

Q.—Find enclosed small stamping, finished white with blue lettering. We are desirous of obtaining information on the finishing of an article similar to same. We wish to enamel article white, with blue lettering, then lacquer over all. We have been doing some experimenting but without success. Our idea of doing this work is to enamel white, dry, then stamp lettering on with rubber stamp, dry, then lacquer over these. The rubber stamp does not give a good, uniform lettering and the lettering has a tendency to run when the lacquer is applied. We could use gold lettering if it is feasible.

A.—There are two factors to be considered in connection with your proposition: First, the basic enamel, which should be of the celluloid type and not the ordinary white enamel used in connection with enameling wood, etc.; second, the lettering would have to be done either by the transfer process or printing (when a rubber stamp is use the ink is not always evenly applied and the pressure is not always the same so that the results are a blurring of the lettering).

It would be advisable to have a small lithographic stone prepared with the wording that you desire. Then with a heavy blue ink applied to the lithographic stone by a small printer's roller, the transfer could be made to the metal article from the stone.

When dry the articles so printed could be lacquered if desired, but it would not be necessary.

In applying a gold bronze it is possible that the rubber stamp method could be used. All that would be necessary would be to apply the gold size to the enameled surface with the rubber stamp

and to sprinkle the bronze powder dry on the gold-sized letters. The bronze adheres to the gold size and when dry the excess could be readily removed with a badgers' or camels' hair brush.

You could probably purchase Decalcomania transfers from manufacturers of such articles.—C. H. P., Problem 3,273.

GUN METAL FINISH

Q.—How can I obtain a gun-metal finish?

A.—In our estimation the sodium nitrate-manganese-dioxide heat black will give you the best results. Match boxes and cigarette cases made of steel are finished by this method. You can make a test and see if the results are satisfactory.

In an iron kettle or pot, heat refined sodium nitrated to 700 deg. Fahr. To every pound of the nitrate add 1 ounce of black oxide of manganese and mix thoroughly.

Immerse the steel parts in the molten mixture for a few minutes (they should be bright, clean and dry), remove and quench in warm water, and then dry out with the aid of boiling water and fine sawdust.

The black finish should be lacquered to protect it, or a very thin coat of beeswax dissolved in turpentine should be applied. This latter method is used to a great extent upon metal goods.

The Swiss black is a very good finish, but requires considerable manipulation to get good results.—C. H. P., Problem 3,274.

JAPANNING TACKS

Q.—We recently commenced experimenting with black japanning of tacks but it seems that so far we have been unable to find anything that will do the work quickly and cheaply enough. We are wondering if you could give us an outline as to what would be necessary to handle small tacks in quantities of 100 pounds and more. The main trouble we are experiencing is in the tacks not drying quickly enough and sticking together.

A.—The most effective method of japanning tacks is by the combination of tumbling and spraying. In other words, as the tacks are in a tumbling motion, the lacquer is sprayed upon them. An oblique tumbling barrel is the best type for the purpose. Its speed of rotation should be about 12 revolutions per minute.

To the inside of the barrel, "leaders" that will pick up the tacks and continuously pour them out toward the bottom of the barrel, should be riveted at intervals. The "leaders" are miniature drains such as carry the rain to the drain pipes from the roofs of houses. They should be placed on an angle of 45 degrees, when riveting them to the tumbling barrel. This method will prevent the tacks sticking. Air drying japans are manufactured for tumbling purposes.—C. H. P., Problem 3,275.

JAP FINISH

Q.—I would be very much obliged if you will explain in detail how to make Jap finish or the brown and gold-on-highlights.

A.—The Aurelia gold finish originally was applied to brass by sand-blasting the brass surface. The high lights were buffed to a good lustre and then the entire surface sprayed with a good deep yellow gold lacquer. These methods have been changed. The brass articles are cleansed, the high lights buffed, and then a chocolate bronze lacquer is sprayed over the entire surface. When partly dry the bronze coating is removed from the high lights by rags and some of the thinner. Then the articles should be dried as usual and finally a gold lacquer should be sprayed over the entire surface. The result will be on drying, the Jap finish or brown and gold the high lights.

Any lacquer firm advertising in the METAL INDUSTRY can furnish the bronze and gold lacquers.—C. H. P., Problem 3,276.

PROTECTING CORES

Q.—We are having considerable trouble in keeping the metal (which it is necessary for us to pour exceedingly hot in certain bronze castings, to obtain the desired results), from burning through the cores, notwithstanding we have tried most everything to prevent this action, even applying a coat of asbestos to the cores, which are small and intricate.

A.—We suggest that you try a mixture of a good grade of black lead and gasoline. Make your mixture to a consistency of a dough and rub the core through your hand. This should prevent the metal from burning in the core. If the core is too small to rub, dip in gasoline and then dip in a blackening of gasoline and black lead with a small amount of molasses added. This should help you considerably.—W. J. R., Problem 3,277.

RECOVERING ANTIMONY

Q.—Can you refer me to any article or furnish me information on the subject otherwise, in reference to an eliminating process for the segregation of antimony from the metal received from the smelting of scrap battery lead.

A.—A method used by small smelters consists of melting the recovered lead containing antimony in a large iron kettle and adding sulphur. Boil the molten metal by immersing a green pole in the metal and keep skimming off the slag, taking samples from time to time in the form of a button and weigh on the Richard scales. If the metal contains a large percentage of antimony, it is best disposed of for babbitt making.—W. J. R., Problem 3,278.

BLACK ON STEEL

Q.—We are having trouble to obtain a dull black oxidized finish on steel, and we would like to know if you can advise us what to do to obtain this finish.

The finish required is like a dull black lacquer finish, but the objection to using lacquer is that it is likely to wear off or be removed by the use of coal oil, as these plates we are manufacturing are used on electric ranges, and it is necessary for the finish to stand up when cleaned with an oily or greasy rag.

A.—The dull black finish you refer to is usually a baked enamel finish such as applied to telephone stands and many electrical articles made of steel. Auto lamp bodies are coated with such enamels. Submit a sample of your product to some enamel manufacturers and have them finish it in a dull black baked enamel finish for you. They will willingly finish samples for prospective customers.

You can also produce a finish such as you desire by boiling the steel parts, which must be perfectly clean and free from oxide and rust, in a solution composed as follows:

Water	1 gallon
Commercial Phosphoric Acid	6 ounces
Black Oxide Manganese	2 "

Support the articles in solution by the aid of iron hooks or frames.—C. H. P., Problem 3,279.

24 K. GOLD SOLUTION

Q.—How can I prepare a 24k. gold solution?

A.—To prepare a 24k. gold solution, purchase pure sodium gold cyanide 24k. This new gold salt is a double cyanide of gold containing approximately 46% fine 24k. gold. A solution can be prepared as follows:

Water	1 gallon
Sodium Gold Cyanide	½ oz.
Sodium Cyanide, 96-98%	¼ to ½ oz.
Pure Caustic Potash	¼ oz.

Temperature, 160° F. at 2½ volts. 24k. or a minimum of 22k. fine gold should be used as anodes. A 14k. gold solution can be made up with sodium gold cyanide, as outlined above, adding to the solution copper cyanide (previously dissolved separately in sodium cyanide, using sodium cyanide and the copper cyanide in equal proportions, with a little hot water for solution). The sodium cyanide should be dissolved first in the water, then add the copper cyanide (copper cyanide contains 70% copper sodium; gold cyanide, 46% gold; so in preparing your 14k. solution figure the percentage of copper necessary in proportion to the gold to make a 14k. alloy). Use a 14k. gold anode. Some firms, however, use an 18k. and keep their gold solution below the 14k. mark.—C. H. P., Problem 3,280.

PATENTS

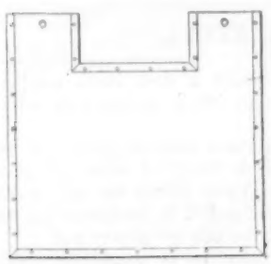
A REVIEW OF CURRENT PATENTS OF INTEREST

1,469,761. October 2, 1923. **Ingot of Refractory Metals and Method of Making Same.** John A. Yunck, South Orange, N. J.

The herein described process of forming an ingot containing tungsten or alloy thereof which comprises the following steps: first, packing fine powder mainly composed of tungsten into a cylinder of soft and ductile metal such as copper, and closing the open end of such cylinder with a plug of the same metal; second, swaging down the cartridge so formed to approximately one-third of its original diameter; third, heating the composite rod so formed in a carbon tube in a non-oxidizing atmosphere until the soft metal envelope has been removed by vaporization and the tungsten particles have been firmly fritted together.

1,470,577. October 9, 1923. **Re-enforced Platinum Anode for Production of Persalts.** Otto Liebknecht, Frankfort-on-the-Main, Germany, assignor to the Roessler & Hasslacher Chemical Company, New York.

A platinum anode reinforced with metallic zinc.

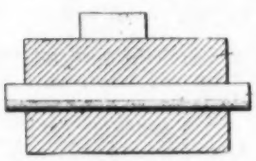


1,470,883. October 16, 1923. **Cathode for the Electrolytic Refining of Metals.** Charles H. Schuh, Brooklyn, N. Y.

A single cathode plate having two main depositing surfaces, non-conducting material about the peripheral edges of said plate, said material being flush with the aforesaid depositing surfaces.

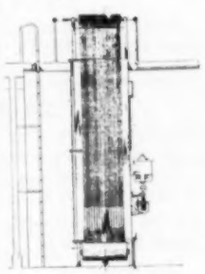
1,471,373. October 23, 1923. **Method of Making Seamless Tubes Rich in Zinc.** William L. Woodward, Lakewood, Ohio.

The herein described method of making seamless tubes which consists in providing a cast tubular body rich in zinc, subjecting said cast tubular body to mechanical treatment, then heating said tubular body so treated and then subjecting the walls of said tubular body to lateral compression.



1,472,024. October 23, 1923. **Wire-Enameling Machine.** John A Lewellyn, Toledo, Ohio.

In a device of the class described, the combination of an enamel bath, an oven adjacent thereto, means for heating said oven, means for causing wire to pass through said enamel bath and subsequently through said oven, means for withdrawing heated air and fumes from said oven and means for preventing contact of outside air with said wire intermediate said bath and oven.



1,472,244. October 30, 1923. **Coating.** John Andrew Daly, New Rochelle, N. Y., assignor to Gold Sealed Denture Process Company, Inc., a Corporation of New York.

The process of coating a body of vulcanite with metal which comprises softening the surface of the body by chemical means and causing a precipitation of a metal upon and below the softened surface of the body.

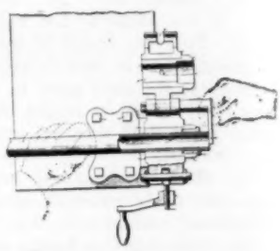
In a device of the class described, the combination of means for applying a coat of enamel to wire, an oven through which said wire is adapted to be passed, a pump for withdrawing air from said oven in the vicinity of the point of entrance of said wire, said oven having an opening to admit air at a point distant from said point of entrance and means for adjusting the size of said admission opening.

1,472,115. October 30, 1923. **Process of Treating Solutions of Metals.** Louis F. Clark, Potrerillos, Chile.

The method of treating a copper solution which consists in subjecting it to a high temperature and pressure and to a reducing agent including formic acid to precipitate copper.

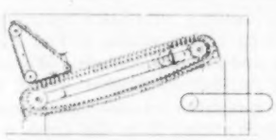
1,472,278. October 30, 1923. **Means for Flanging Soft-Metal Pipes.** Philip Mueller and Anton C. Schuermann, Decatur, Ill., assignors to Adolph Mueller, trustee, Decatur, Ill.

In a means for flanging soft metal pipes, the combination of a plurality of pipe engaging jaws hingedly connected and adapted to be closed to form a pipe receiving bore, and a stop carried by said jaws, said stop being freely movable transversely of the bore of the jaws when in closed position but secured against longitudinal movement relative to said bore.



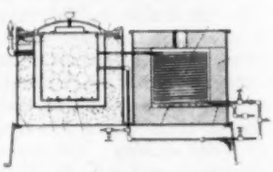
1,472,623. October 30, 1923. **Machine for Casting Metal Pigs or Bars.** Edward H. Acton, Niagara Falls, N. Y., assignor to Aluminum Company of America, Pittsburgh, Pa.

In a casting machine, in combination, a delivery spout for molten metal, a series of molds traveling past the spout to receive molten metal therefrom, and a series of reflectors traveling with the molds between the same and the spout in a path diverging from the path of the molds, the deflectors being spaced from the molds and overhanging the adjacent edges of successive molds.



1,472,702. October 30, 1923. **Annealing Furnace.** Benjamin M. Walpole, Providence, R. I., assignor to National Gas Furnace Company, Providence, R. I.

An annealing apparatus comprising a work-receiving chamber, and means for introducing a non-oxidizing medium into and causing it to circulate through said chamber for raising its internal temperature to an annealing heat.



1,472,738. October 30, 1923. **Aluminum-Base Alloy and Method of Treating It.** Robert S. Archer and Zay Jeffries, Cleveland, Ohio, assignors to Aluminum Company of America, Pittsburgh, Pa.

A worked and quenched workable aluminum base alloy having substantially fixed physical properties while maintained at room temperature, free from magnesium and containing not less than about 3.5 per cent copper, the physical properties of the alloy being capable of variable improvement by aging the alloy at a temperature above about 100° C.

1,472,739. October 30, 1923. **Aluminum-Base Alloy.** Robert S. Archer and Zay Jeffries, Cleveland, Ohio, assignors to Aluminum Company of America, Pittsburgh, Pa.

A quenched and artificially aged aluminum base alloy free from copper except as an impurity, and containing magnesium and not less than about 0.5 per cent silicon, the alloy being hard and having high tensile strength.

1,472,740. October 30, 1923. **Aluminum-Base Alloy.** Robert S. Archer and Zay Jeffries, Cleveland, Ohio, assignors to Aluminum Company of America, Pittsburgh, Pa.

An aluminum base alloy containing about 4.5% copper, 0.5% magnesium, 0.75% silicon, the alloy having been quenched from a temperature above about 500° C. and artificially aged at a temperature above about 100° C.

1,472,781. November 6, 1923. **Welding or Soldering Composition.** Abraham Baewskin, Chicago, Ill.

A composition of the class described including zinc phosphide, 7 parts; zinc oxide, 3½ parts; sodium bicarbonate, 14 parts; boracic acid, 10½ parts; and vaseline 10 to 20 parts.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Making Metal Patterns by Electro-Deposition

Written for The Metal Industry by WILLIAM J. REARDON, Foundry Editor

This method was developed by Arthur K. Laukel at the State Pattern & Manufacturing Company, 740 Meldrum avenue, Detroit, Mich. Through electro-deposition metal patterns are made very accurately owing to the fact that there is no shrinkage involved. Since these patterns are exact duplicates of the original in size, shape and finish, it is obvious that machining, filing, and scraping is practically all eliminated. Patterns can be made of copper, brass, nickel, or any other metal or combinations of metal (for example, a nickel surface with a copper backing).

The method of procedure is similar to that used in electrotyping. Casts of wax, plaster of paris, or any fusible alloy are taken of the desired pattern to be reproduced. These casts are made conductive on the impression surfaces. In the case of wax or plaster of paris, graphite is used to make the conductive surface. Contact wires are inserted in the casts to make a connection in the plating tank and conductive surface of the cast. Suitable insulation is given these casts to prevent the metal from spreading on the non-conductive surfaces. These casts are then placed in the desired plating solutions, and are allowed to run until the desired thickness is obtained. The casts are taken from the bath and the metal deposits removed. They are backed up with some suitable alloy, such as white metal, to give strength, if necessary. The partings are then checked very closely and

FIG. 1. VARIETY OF PATTERNS MADE BY ELECTRO-DEPOSITION

machined or ground off, if required, and from this point the procedure is identical with the old method.

The deposition process can be used for split patterns mounted on both sides of a plate, split patterns mounted on cope and drag plates, split patterns mounted on one side of a plate, cope and drag plates where patterns and plate are cast integral. Where cast aluminum match plates are used, cope and drag plates could be very easily substituted by this method. Patterns to be gated can be made in halves and sweat together. This process includes core boxes. One will readily see that the whole realm of the metal pattern industry is completely covered.

Note on Fig. 1, the variety produced. The method is so sensitive that it will reproduce the finest hair line. It is possible to ascertain whether the patterns are made from a mahogany, pine, or metal original, as, in mahogany, the grain of the wood can be clearly seen on the finished article. Center lines on wood or metal

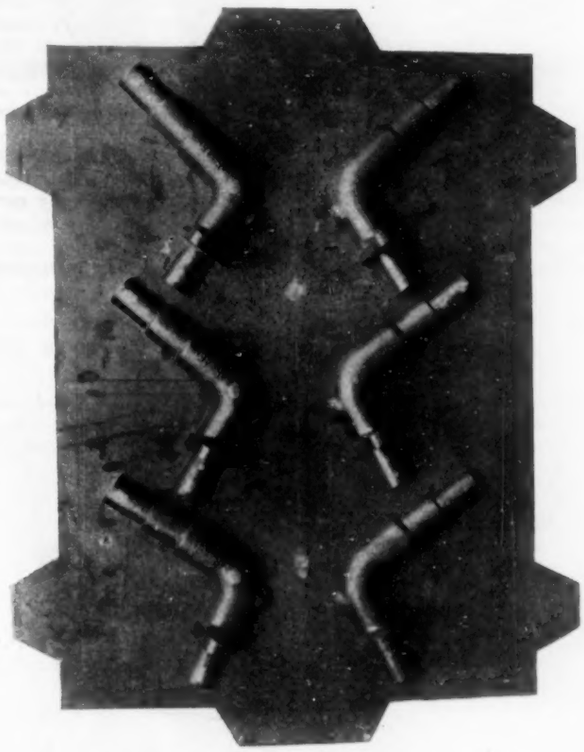


FIG. 2. PLATE OF PATTERNS MADE BY ELECTRO-DEPOSITION

patterns to be reproduced show up very plainly. Also, note on Fig. 2 a plate of patterns made by this process.

ADVANTAGES

The patterns produced will not vary over three-thousandths of an inch.

The surfaces are exact reproductions of the original.

Production of patterns is greatly increased when a number of patterns are necessary; time is not directly proportional to the number of patterns to be produced, as in the old method.

Costs are reduced because the method is drawing nearer to a mechanical process, as all filing, scraping and machining are eliminated.

Patterns and core boxes can be made of wood from which trial castings can be made. The castings can be checked very closely for weight and sizes. The patterns and core boxes can be checked for practicability in the foundry and core room and any necessary changes can be made on the wood patterns or core boxes. This does not entail a great deal of expense. After the wood patterns and core boxes are made perfect in all respects, any number of

metal patterns can be made from these originals. This does away with making a master pattern when it becomes desirable to put an experimental job into production.

In work that is machined with the use of an air chuck, it is also apparent that patterns made in this way would save a great deal of trouble for the machine shop.

This method is fast being adopted by many of the large automobile manufacturers in the vicinity of Detroit, due to the high degree of accuracy obtained in producing duplicate metal patterns, as well as the comparatively low cost. One of the noteworthy advantages, both in time and cost, is that a pattern can be taken while it is in work and a plaster cast made from it, which requires but a few hours, and as many accurate duplicate patterns made from the cast as may be desired.

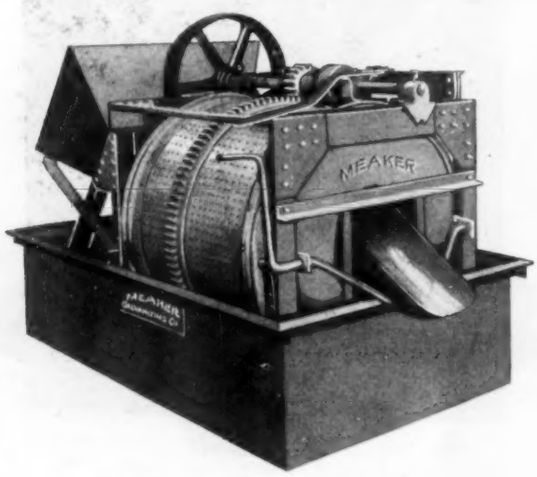
This method is filling a long-felt want in the foundry and to my mind is the one big advance step made in the producing of metal patterns in the last twenty-five years. I do not think anyone interested in the process would have any trouble obtaining license rights to use the process, together with the necessary information to operate it, from Mr. Laukel. The idea appeals to me as one that every foundry would be interested in to get away from all the talk of patterns and castings not being alike. I find that it is very difficult to obtain patterns where every one is alike, and it is always blamed on the foundry.

MEAKER WASHING MACHINE

Metal manufacturers have perceived the advantage of a mechanical method for washing metal parts instead of the old and undesirable method of attempting to clean them by hand

The Meaker Galvanizing Company, 1246 Fulton Street, Chicago, Illinois, has designed and is manufacturing a special washing machine for cleaning parts prior to further finishing. The operation of the Meaker Washing Machine is said to be very simple. The goods to be cleaned are placed in the feed hopper by continuous or intermittent operation and from there are guided into the drum. The drum is slowly revolved at approximately six revolutions per minute for a few minutes, and during this time, boiling solution, by mechanical means, is being continually thrown over and around the pieces to be cleaned which are changing positions so that all their surface and every corner is being reached during the operation. No injury or fracture of parts can occur due to the special design of paddles and the slow rotation of drum.

Some manufacturers of finished steel products, particularly



MEAKER WASHING MACHINE

stampings, drawn parts, screw machine work, machined pieces, etc., frequently find it to their advantage completely to remove grease and oil before the pieces are assembled. Other manufacturers are obliged to remove grease and oil because the parts are to be electro plated either with zinc, copper or nickel or else japanned, enameled, lacquered or painted, and before any of these coatings can be thus treated the underlying surface of the metal must be chemically free from any grease, oil or any other interference.

The shift lever is thrown and the drum automatically moves its load through the discharge chute; a simple operation but complete in its effectiveness. It is claimed that grease and oil are removed from the pieces more thoroughly in two minutes in the Meaker Washing Machine than they would be after two hours' treatment in a hot solution when the parts lay dormant, which is the case in ordinary cleaning tanks.

The principal of the machine is similar to the cylinder type laundry and household type washing machine. The Meaker Washing Machine is a compact unit only 80" long, 54" wide and 54" high. The quantity of steam required to heat the cleaning solution is said to be very small. It is recommended that Meco Metal Cleaner be used, so that the cost of chemicals may be held to a minimum. One-half h.p. is ample with full load in operation, and with the aid of one man, from 5 to 10 tons of small parts can be cleaned in a single shift day. This unit is a belted, direct driven machine, easily operated with ready accessible adjustments such as clutch lever to stop and start drum, and is furnished complete with steel tank, steam coils and driving pulley; weight approximately 1,700 pounds.

NICKEL SALTS

The John J. Vay Company, 721 Frankfort avenue, N. W., Cleveland, Ohio, is putting on the market a new brand of nickel salts called Vayco High Speed Salts. The manufacturers state that the Bureau of Standards has tested this formula and recommends it as a most efficient preparation for the nickel plating of brass, copper, steel, white metal die castings, and malleable iron. The salts are said to give a greater depth of deposit in less time and a bath of either single or double nickel salts. The solution will not crystallize in cold weather; it gives a snow-white deposit of a close grained nature.

Vayco salts are sold finely pulverized and packed in 25 pound muslin sacks. It is recommended that these sacks simply be suspended in the solution and the bath allowed to do the rest. It is also stated that these salts may be added to other nickel baths when they need replenishing. It is claimed also that the use of these salts results in a deposit which takes less time to buff and color up.

FLOOR AND BENCH GRINDERS

The new Grinder Bulletin No. 1305 of the Hisey-Wolf Machine Company, of Cincinnati, Ohio, illustrates and describes in detail the full line of new and improved two-wheel floor and bench grinders.

Floor stand grinders are made in seven sizes, ranging from ½ to 10 hp. capacity. Bench grinders in two sizes, ½ and 1 hp. capacity.

The following are a few noteworthy features:

Full safety motor starter, which gives maximum production to the motor while starting and when in operation.

Cone shaped end heads permit maximum working space around grinding wheels.

Spindles and ball bearings are of extra large size.

Liberal wheel spacing sufficient for two operators.

Full safety enclosed and adjustable wheel guards can be furnished for all grinders.

AN ALMOST UNBREAKABLE LAMP

What is claimed to be an "almost unbreakable" incandescent lamp is now being marketed by the Greater Service Electric Company, of 329 Broad street, Newark, N. J.

The lamp is an improved Mill Type, the stem supporting the coiled filament being much stronger than other lamps. This bulb, known as the "Briterlite Unbreakable Lamp," will withstand excessive vibration and knocking around; to break the filament, one must break the glass.

The lamp is especially adapted for use in machine shops, factories, mills, garages, places near railroads, etc., and comes in 25 and 50 watt sizes.

ONE-PIECE FOUNDRY FURNACE LININGS

By J. L. Cummings

Ramtite is a plastic, putty-like product, resembling fire brick in the green state and can be molded into practically any shape or form desired. The basic ingredients of this material are virgin materials and of a better grade than manufactured in high-grade fire brick. This product as a whole is chemically balanced to eliminate spalling and shrinkage as far as possible, as well as to adapt itself in the replacing of fire brick linings, thus enabling the user to install same in the quickest time possible and to give long life and refractory value. It stands a pyrometric cone test of 3146° F.; conducts heat more slowly than fire brick, making the losses of heat radiation lower. On actual test on a four and a half inch wall the temperature on the outside of the wall was sixty-five degrees lower than on the outside of a fire brick wall of the same furnace, with a maximum temperature of 2900° F. on the inside.

Fig. 1 illustrates an oil-fired, tilting furnace used to melt an alloy and shows how the ramming operation is accomplished. Fig. 2 shows the completed lining, while Fig. 3 shows a lining of Ramtite that was installed in the latter part of December, 1922.

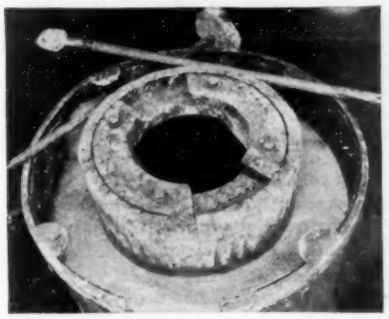


FIG. 1. HOW RAMMING IS ACCOMPLISHED

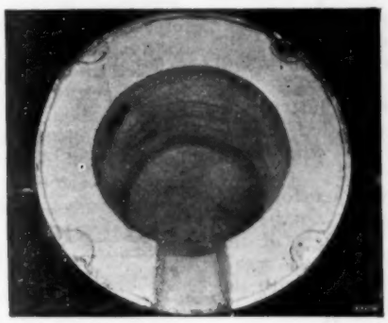


FIG. 2. COMPLETE LINING

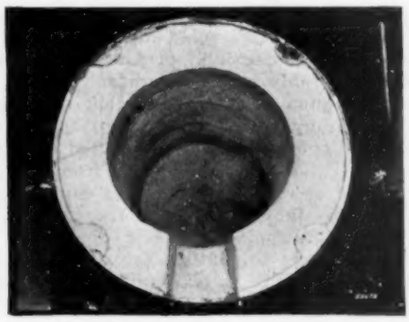


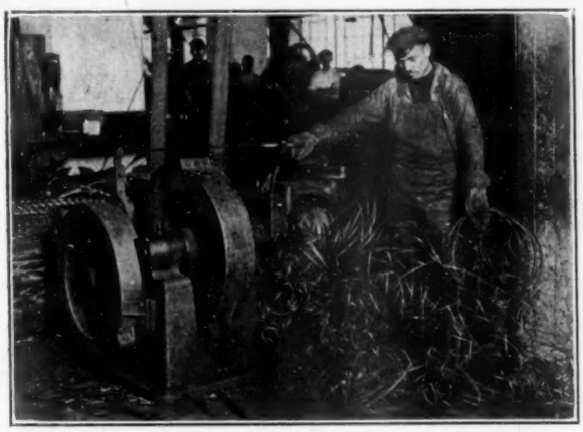
FIG. 3. RAMTITE LINING 8 MONTHS OLD

The photograph was taken on August 5, 1923, and the lining is still in good condition, available for many more weeks of service.

Anyone who can handle a seven-pound mallet can apply Ramtite. When ramming furnace linings, a foundry butt and pea rammer is a very good tool to use. It is also an excellent patching material for quick repairs or for making special shapes. It is made by S. Obermayer Company, Chicago, Ill.

SCRAP BUNDLING MACHINE

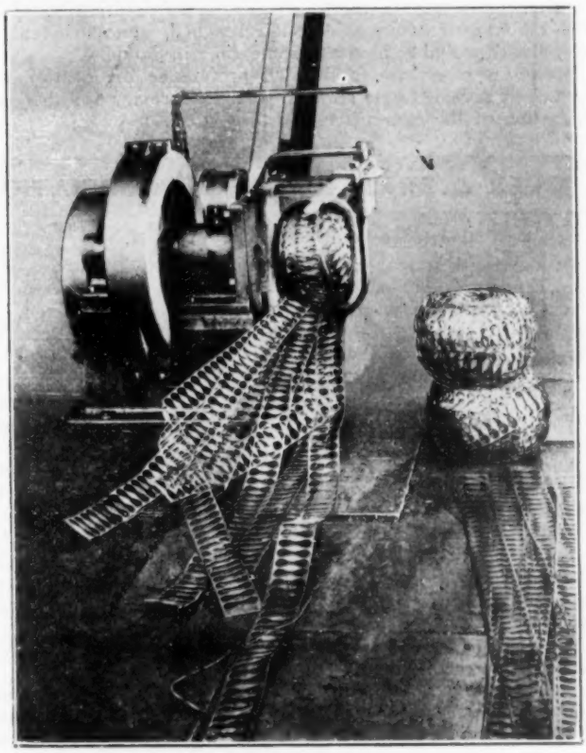
The Stanley Works of New Britain, Conn., have developed and are marketing a new scrap bundling machine which can be used on steel, tin, aluminum or brass, in the form of long or short strips or coils.



BUNDLING SCRAP WIRE

This machine, with a head 14¾ inches in diameter by 9½ inches, will make a ball weighing approximately 100 pounds out of stock measuring up to 16 feet long by 5 inches wide and .0165 inches thick. The machine is also said to be capable of handling scrap in any length up to 10 inches wide and .171 inches in thickness. It is made in two types—belt or motor driven. Each type can be fitted with three different sized heads—14¾ x 9½ inches; 16 x 16 inches; 21 x 21 inches. Other size heads can be made to meet requirements.

The machine is built sturdily and said to stand a great deal of abuse. The head is made of cast steel and the winding shaft of hardened tool steel; the bearings on the main wind shaft are bronze bushed, while those which support the back gear shaft are genuine babbitt. The gears, where necessary, are made of cast steel and the pinions of machine steel with cut teeth. The gears are guarded with heavy cast iron guards ½ inch thick. The lever operating the clutch which has direct control of the stopping and starting of the machine is located over the head of the machine and extends beyond. It is easily reached and the machine can be stopped quickly, if necessary. In the motor driven type the motor (7½ H. P. 1200 R. P. M. any type) is located above the clutch pulley shaft. In this way the motor type machine requires no more floor space than the belt-driven machine.



BUNDLING STRIP

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

Headquarters, 140 So. Dearborn St., Chicago, Ill.

At a meeting of the Board of Directors of the American Foundrymen's Association, held in New York November 20th, it was unanimously voted to hold the next convention of the Association and exhibit of foundry equipment in the fall of 1924, preferably in the month of October.

One argument advanced is that the foundry industry does not profit by spring conventions to the extent that it does from fall conventions. It is pointed out that men who attend the conventions get new ideas from papers and discussions presented at the meetings, from contact with other foundrymen whom they meet, or at the exhibits, which can be advantageously applied to their operations. Members of the many technical committees receive inspiration from the meetings and incentive to accomplish certain results, but with the coming of warm weather and summer vacations the application of methods and ideas are put to one side and too often forgotten altogether. In the fall, the vacation period is over. Managers, superintendents and foremen have returned from them rested from their labors, and with the enthusiasm for work that comes with autumn days, they return from the conventions ready to put into practice immediately the things they have learned that will help them to improve the quality and quantity of their products.

In considering location, it was felt that the central west was the logical place, as the Milwaukee convention in 1918 was the only one which has been held west of Cleveland since the Chicago convention in 1914. The selection of a city was left to a special committee appointed by the President. The cities from which invitations have been received and which were given favorable consideration alphabetically listed are Chicago, Detroit, Indianapolis, Kansas City and Milwaukee. The facilities which these cities have to offer in the way of hotel accommodatons, meeting rooms and exhibition buildings will be investigated and decision reached, announcement of which will probably be made some time in January.

Members who have a decided preference of location are invited to present their reasons to the Secretary for the consideration of the committee.

COPPER & BRASS RESEARCH ASSOCIATION

Headquarters, 25 Broadway, New York, N. Y.

At the third annual meeting of the Copper and Brass Research Association, held November 15th at the Association's offices, 25 Broadway, New York, directors were elected for the ensuing year. Among the members of the executive committee are the following:

Edward H. Binns, President, C. G. Hussey & Company; **F. S. Chase,** President, Chase Metal Works; **H. J. Rowland,** Secretary and Sales Manager, Rome Brass and Copper Company.

Among the directors are the following: **Henry F. Bassett,** President, Taunton-New Bedford Copper Company; **Carl F. Dietz,** President, Bridgeport Brass Company; **B. Goldsmith,** President, The National Brass & Copper Company; **E. O. Goss,** President, Scovill Manufacturing Company; **U. T. Hungerford,** President, U. T. Hungerford Brass and Copper Company; **A. B. Seelig,** Manager, Michigan Copper & Brass Company.

After the annual meeting, the Directors elected the following officers:

President, **R. L. Agassiz;** Vice-Presidents, **C. F. Kelley, F. S. Chase, Walter Douglas, H. J. Rowland** and **U. T. Hungerford;** Treasurer, **Stephen Birch;** Secretary, **George A. Sloan;** Manager, **William A. Willis.**

In commenting upon the work of the Association, which is an unincorporated, voluntary organization composed of the principal Brass and Copper companies, R. L. Agassiz, President of the Association, said:

"The program for 1924 as approved by the members at today's meeting, provides for an extension of the Association's activities, in line with our plans to develop new and increased outlets for brass and copper. We feel that the Association is serving satisfactorily the purposes for which it was created and that much progress has already been made.

"Copper consumption in the United States at the present time is about 70 per cent of the world's production. Our survey of channels of consumption indicates that the ultimate or potential demand for copper and brass in this country has by no means been reached."

AMERICAN ELECTROPLATERS' SOCIETY

CHICAGO BRANCH

Headquarters, care of R. J. Hazucha, 5128 Warwick Ave.

Chicago Branch of American Electroplaters' Society will hold its next Annual Banquet on Friday evening, January 25th, 1924, at Chicago Elks' Club, 174 W. Washington Street, Chicago.

All concerns doing electroplating are invited to send their foremen or any other representative. There will be an educational program in keeping with previous affairs, also high class entertainment; price $2.50 per plate.

There is also being arranged a theatre party for visiting ladies on the evening of the banquet. Those wishing to make reservations, please write R. J. Hazucha, Secretary, 5128 Warwick Avenue, Chicago, Ill.

PHILADELPHIA BRANCH

Headquarters, care of Philip Uhl, 2432 N. 29th St.

The Philadelphia Branch Banquet was held on Saturday, November 24th, in Mossbach Hall on Girard avenue and Thirteenth street. During the afternoon, a session was held which was devoted to the reading of papers and a discussion followed it. An exhibit was held consisting of various new and standard finishes. The samples were furnished by members of the Society.

The banquet was held at 7 P. M. and over 200 attended. After the banquet, the remainder of the evening was spent in dancing and enjoying a general good time. The Philadelphia Branch is to be congratulated for the success of the jollification. With George Gehling in charge of the arrangements and practically every member of the Branch helping in one way or another, the occasion was a great success.

THE POWER SHOW

Headquarters, Grand Central Palace, New York.

The Second National Exposition of Power and Mechanical Engineering will be held from Monday, December 3, to Saturday, December 8, inclusive, at Grand Central Palace, New York. The show opens twelve, noon, and closes 10:30 P. M. each day.

Devices and apparatus for generation and utilization of power will be shown. This includes boilers, stokers, superheaters, economizers, air preheaters, prime movers, pumps, condensers, valves, control apparatus, measuring instruments, handling equipment, transmission equipment such as ball bearings, clutches, belting, etc., as well as machine tools. The exhibits will be of interest to all industries which use heat or power in any form.

PLUMBAGO CRUCIBLE ASSOCIATION

The Plumbago Crucible Association has submitted its Standard Sizes of Brass Crucibles for approval by the American Engineering Standards Committee. These standard sizes were developed under a committee originally under the auspices of the American Institute of Metals, consisting of representatives of users and of crucible manufacturers, the work having been begun in 1913. In 1915 the committee completed its work by the

selection of certain sizes then made, recommending these for adoption as standards. In 1919, at the instance of the American Institute of Metals, a vote was taken on the formal approval of these sizes as standards, but they were never put into actual use, on account of disagreement regarding the selection of sizes on a purely arbitrary basis.

As a result, one of the members of the Plumbago Crucible Association was employed to work out a definite and comprehensive plan of standard sizes. This was done on the basis of the shape that had become established through long usage, and in a series in which every size of crucible bore a definite relationship to every other size, and was susceptible to calculation of its capacity by the same formula. In working out the series, certain adjustments were made in order to avoid confusion with existing sizes and to permit specifying, as nearly as possible, the same size number in the new line of crucibles as had been the case, on the average, in the old unstandardized sizes. All but two crucible manufacturers who make crucibles for brass foundry use, have made molds to conform to the new sizes. Under this system the product of every crucible manufacturer will have the same outside shape, so that wherever they are used, the tongs and bails will fit, regardless of the source of supply.

Personals

Amor Frederick Keene has now opened offices at 42 Broadway, New York City, as consulting engineer.

Stanley A. Richardson has returned to the faculty of the Department of Engineering of Lewis Institute, Chicago, Ill., and has resumed charge of the courses in metallurgy and metallography offered by that college.

C. A. Crumpton, who formerly operated a polishing and plating shop in Chicago has joined the sales force of the General Abrasive Company, Niagara Falls, N. Y., manufacturers of artificial abrasives, as salesman and demonstrator.

Albert W. Gray, has become works manager for the Bristol Brass Company, Bristol, Conn. He was formerly works manager at the Billings & Spencer Company, Hartford, and succeeds John F. Wade, who will take charge of the brass company's real estate.

W. G. Rowell, New England and New York State representative for the past ten years for R. B. Seidel, Inc., has severed his connection with that firm and is now representing the Foreign Crucibles Corporation, Ltd., 829 East 15th street, Brooklyn, New York.

H. F. Chase, well known in the nickel and nickel alloys field, has been appointed by the American Nickel Corporation of Clearfield, Pa., to represent them in the Metropolitan District for the sale of their 99 per cent pure malleable nickel and Mond nickel alloys. He will have offices at 350 Madison avenue, New York City.

E. E. Helm has been appointed district manager at Detroit for the Bridgeport Brass Company of Bridgeport, Conn. Mr. Helm comes from Akron, Ohio, where for two years he was manager of the Industrial Bureau of the Akron Chamber of Commerce, being particularly interested in diversifying the industries of the Rubber City and in that work, according to Chamber of Commerce reports, he was very successful.

Deaths

JAMES SAMUEL ELTON

James Samuel Elton, 85, died November 10th, 1923, at his home, 70 Church Street, Waterbury, Conn., after a long illness with heart trouble. Mr. Elton was born in Waterbury, November 7th, 1838, and was the son of John Prince and Olive Margaret (Hall) Elton. The Elton family has been prominent in Watertown and Waterbury for several generations, its members being descendants of John Elton, who came here early from Bristol, England, and settled in Middletown. From that city came Dr. John Elton to Watertown, then Westbury, as a practicing physician. He died in 1880 and his son, Samuel, succeeded to his practice, being known far and wide in this part of the state. Dr. Samuel Elton's son, John Prince Elton, came to Waterbury in his young manhood and was prominent in the early days of the brass industry, being president and director of the Waterbury Brass Company. He also helped to organize the Waterbury National Bank, of which he was a director and president until his death.

JAMES SAMUEL ELTON

His son, James S. Elton, was educated at the school of Rev. C. W. Everest in Hamden, and at General Russell's military school in New Haven. After a short period of apprenticeship, in the American Pin Company and at the New York store of the Scovill Manufacturing Company, he entered the employ of the Waterbury Brass Company, in 1863, with which company he was connected during the remainder of his active business life. Within a year he was made secretary of that company, and on the death of Joseph C. Welton in 1874, succeeded to the presidency, holding that office until the Waterbury Brass Company was merged with the American Brass Company, becoming vice president of that organization. He was also prominently connected with many other manufacturing companies, but had resigned his directorships in most of them; retaining, however, that in the American Hardware Company. In 1868 he was elected a director of the Waterbury National Bank, of which his father was the second president, and in 1896 became its president, holding that office for more than 20 years. He has been a director of the New York, New Haven and Hartford Railroad; and had served on the board of directors of the Waterbury Hospital, the Bronson Library and Westover School. He is survived by one son, John Prince Elton, and two granddaughters, the Misses Deborah and Charlotte Elton.

All the offices of the American Brass Company and its branches in Waterbury were closed November 13th from 2 to 2:30 o'clock in respect to the memory of Mr. Elton, for so many years an officer and director in this company and its predecessor, the Waterbury Brass Company.

At a meeting of the board of directors of the American Brass Company, a resolution was adopted eulogizing Mr. Elton and his services to the brass industry.

ARTHUR L. STARK

Arthur L. Stark, 55, of Elyria, Ohio, died at his home on October 18th, after an illness of 2 years. Mr. Stark was general superintendent of the Harshaw, Fuller & Goodwin Company of Elyria, Brooklyn and Philadelphia, and was a graduate of the Case School of Applied Science, Cleveland. Mr. Stark had contributed several inventions to the chemical industry during his 25 years in that business.

Mr. Stark was born in Cleveland, December 15, 1868. He came to Elyria, Ohio, in 1898 to become general superintendent of the Elyria plant of the Harshaw, Fuller & Goodwin Company. A little later he was elected a director and then one of the vice presidents of the company. At the time of his death he was vice president and superintendent of plants. His genius contributed largely to the development and improvement of many of the items produced by the company. He was distinctly a 24-hour man in every detail and requirement.

He leaves his wife, Mrs. Anna L. Stark and two brothers, Edgar Stark of Elyria, and Charles Stark of Cincinnati.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

DECEMBER 1, 1923.

There has been a marked increase in brass mill products during the past week but such increase is only a seasonal one, according to officials of the three big brass industries here. They all voice a general spirit of optimism, however.

John H. Goss, general manager of the **Scovill Manufacturing Company,** states that the low point for his company was reached in August and since then there has been a gradual increase in the number of men employed and in the total number of wage hours per week. He stated that he looked for a good winter with keen competition but a good market. There are all shades of opinion on the matter, he states, from the deepest indigo to the brightest optimism, but he believes business is going to be better and says that it is better already.

Edmund H. Yates, secretary of the American Brass Company, states that the markedly increased buying of brass products recently is what always occurs at this season and is doubtful if the present buying is anything out of the ordinary.

Officials of the **Chase Companies** do not believe that the present increased buying will affect the hours of employment of the number of men employed at their plants yet. If the buying is continued through the month, an increase in the working force may be expected but there has been no reflection of an upward trend yet. Various brass officials stated that copper which has been very low appears to be steadying. Brass, too, has declined, and the buying which frequently follows a decline, they say, has steadied prices so that the present seasonable increase is likely to check any further decline in the price of brass.

Most of the local manufacturers attended the annual meeting of the **Manufacturers' Association of Connecticut,** held in the Hotel Taft, New Haven, Nov. 22. **E. O. Goss,** president of the Scovill Manufacturing Company is one of the directors of the association.

A meeting was held last month in the Chamber of Commerce Hall of representatives of the brass and copper industry of New England, for the purpose of selecting members of a New England Advisory Board of the American Railway Association, car service division, which will attempt to settle disputes between railroads and shippers of this section.

Four members of a committee of five to represent the New England brass and copper industry were chosen. They are **J. D. Heffernan,** traffic manager of Scovill Manufacturing Company; **P. W. Brown,** traffic manager of the Chase Companies; **W. H. Pease,** traffic manager of the Bridgeport Brass Company, and **H. W. Richardson,** traffic manager of the American Electrical works, Phillipsdale, R. I. Committees representing other industries in New England will be chosen and the joint committee will probably meet in Boston to organize and get into action. It will study production, markets, distribution of trade channels of the commodities local to each district with the view of effecting improvement in trade practices when related to transportation to promote car and operating efficiency in connection with maximum loading and proper handling of cars by shippers and railroads.

John A. Coe, president of American Brass Company, at a meeting in the Chamber of Commerce Hall, Nov. 20, to discuss city problems, declared his belief that the brass making industry of the country would remain in the Naugatuck Valley in spite of the fear to the contrary held by some people. The old saying taught when he entered the industry, that the brass business doubled every 10 years had been proven true by facts, he said. He favored changes in the immigration laws so as to attract to this country a better class of immigrants, who would bring their families, settle down and make good citizens. The city must provide better housing conditions to attract them here.

E. O. Goss, president of the Scovill Manufacturing Company, urged that the harbors contiguous to the Naugatuck Valley be developed so as to afford greater facilities for water shipment for the district. In spite of the present lack of proper harbor facilities, the shipments by water from the district were now almost equal to the rail shipments. If the harbors were developed and proper use made of them, the local railroad system would be amply able to handle the freight of this section without delays. All points east of the Alleghanies and the Pacific coast were more accessible to New England than they are to the Middle West if we make use of the water facilities.

F. S. Chase, president of the Chase companies, urged that greater efforts be made towards bringing power from Canada for local use rather than robbing the Pennsylvania hills of what might be needed for fuel alone in future years and eliminating the waste in sending freight cars back empty that brought the coal here.

The **Lux Clock Company** has lost its petition to have the **Scott Clock Company,** of New York, declared bankrupt, Judge Hand having dismissed the complaint and also denied the request of the complainant for leave to amend. Judge Hand asserted such procedure would permit firms to continue to harass other concerns indefinitely with the imputation of insolvency. Attorney Weisman, for the Lux Company, claimed the bill owed is a large one and that the attempt to force bankruptcy was made only because the New York bankruptcy law makes this procedure necessary when a company has less than 20 creditors.—W. R. B.

BRIDGEPORT, CONN.

DECEMBER 1, 1923.

C. F. Dietz, president of the **Bridgeport Brass Company,** will address the industrial relations group on the subject, "Graphic Presentation of Facts to Employees," at the annual meeting of the Manufacturers' Association held in New Haven, Nov. 22. Pres. Dietz was recently elected a director of the Copper and Brass Research Association at its third annual meeting held in New York last month.

The publication and advertising departments of the **General Electric Company** in this city will be combined on December 1 with **Martin Rice,** manager of the publicity department, in charge of both. **Frank H. Gale,** advertising manager, will become manager of convention and exhibits.

W. H. Pease, traffic manager of the Bridgeport Brass Company, has been appointed a member of the New England Advisory Board of the American Railway Association, which board is to attempt to settle disputes between shippers and railroads.

Erection of a new office building by the **Weidlich Brothers Manufacturing Company,** on Connecticut Avenue, to cost approximately $30,000 will be started this month, contract having been let to the Hewlett Construction Company. Work has been started on the new boiler house, coal hoppers and 150 foot chimney for the **Ashcroft Manufacturing Company,** on Elias Street.

For the first time in the history of the organization, wives of the members attended the annual meeting and dinner of the **Bridgeport Manufacturers' Association** held November 20. The women discussed and voted on the questions. **E. Kent Hubbard,** president of the state association, was the premier speaker. **Earl Constantine,** executive secretary of the **National Industrial Council,** spoke on the workings of that organization. **J. E. Edgerton,** president of the **National Association of Manufacturers,** spoke on "The Manufacturers' Problems for 1924."—W. R. B.

TORRINGTON, CONN.

DECEMBER 1, 1923.

Mason Turner has been appointed United State vice consul at Ceylon and will leave immediately to take up his duties. He will be stationed at Colombo, capital city of Ceylon. Mr. Turner is a son of **L. G. Turner,** who was for many years president of the **Turner & Seymour Manufacturing Company** and a great-nephew of **Elisha Turner,** one of the founders of that company and a pioneer manufacturer of the Naugatuck Valley.

The **Torrington Building Company** has been awarded the contract for a six-story addition to the B and K department of the **Landers, Frary & Clark** plant in New Britain. The building will be 66 x 161 feet of heavy mill construction. This is the 27th contract to be received by the Torrington Building Company from Landers, Frary & Clark since 1905.

Subscriptions to the **Charlotte Hungerford Hospital Fund** in the drive just completed totaled $12,624.10, of which half was given by Uri T. Hungerford, donor of the hospital. —J. H. T.

ROCHESTER, N. Y.

DECEMBER 1, 1923.

Contrary to expectation there is a lack of optimism in the metal trades in Rochester this month. While there has not been a marked slowing down of business, there is a feeling of disappointment that a greater degree of activity has not manifested itself. Business among the brass foundries throughout the city is very quiet and shows no improvement or promise for betterment before the New Year.

Business among the metal workers in the larger plants about town is said to be quite steady, and that in view of present world unsettlement it is figured that conditions are quite as good as might be expected. There was much anticipation in certain directions on the advent of cooler weather, but the expected has not made its appearance as yet.

One encouraging feature of the past month is the fact that no manufacturing establishment will admit of decreased production, and working forces have been kept intact all during fall. Purchasing agents report production to have made inroads in stocks of copper, brass and aluminum during the past two months, and that since the 10th inst. there have been many arrivals of non-ferrous materials from sources of supply to replenish stocks.

No new industries have been announced during the past month. The metal-plating industry is unusually quiet for this season of the year.—G. B. E.

TRENTON, N. J.

DECEMBER 1, 1923.

Metal industry conditions are showing signs of picking up and it is believed that the worst is over for this season. **William G. Wherry,** head of the **Skillman Hardware Manufacturing Company,** who recently returned from an extensive trip to St. Louis and other points in the West, says he sees better times ahead. The past two months were dull ones for business, but things are now picking up. In the West I found a scarcity of finished hardware of all kinds and this is good news for the manufacturer. The stock of hardware is scarce and this means we will receive orders from now on. Other Trenton plants also report business as being better.

Upon application of counsel for the receiver, Vice Chancellor Buchanan has issued an order dissolving the partnership of the **Duncan Mackenzie Sons Company.** Joseph W. Mackenzie and Mary J. Mackenzie, the two partners, instituted suit for dissolution against the managing partners. Three years ago the Mackenzie company had assets of $400,000. Since then assets dwindled down to $155,000. The plant was recently sold to satisfy claims of the **Waterbury Brass Goods Company** and the **Blake & Johnson Company,** also of Waterbury.

Martin Metals Foundries, of 15 Exchange Place, Jersey City, N. J., has been incorporated at Trenton with $100,000 capital stock to smelt, cast, refine with aluminum, tin, zinc, copper, brass, lead, nickel and other ores, metals and minerals. The incorporators are Charles J. Skinner, 9 Rutgers Place, Jersey City; John R. Turner, Basking Ridge, N. J., and Alfred F. McCabe, 200 Winthrop Street, Brooklyn.

Frederick Young Company, of 50 Wilson Place, Irvington, N. J., has been incorporated at Trenton with $100,000 capital to manufacture all kinds of articles from copper, tin, zinc, lead, brass and bronze. The incorporators are Frederick Young, Laura M. Young and Leonard C. Lotz.

Empire Miniature Lamp Corporation, of 20 Clinton Street, Newark, has been incorporated at Trenton with $100,000 capital to manufacture electrical fixtures and lamps. The incorporators are Irving A. Fucht, Stephen Brozyna and Isaac Rocack, all of 300 Main Street, Orange, N. J.

Stockholders of the **Passaic Metal Ware Company,** Passaic, N. J., have authorized an increase of capital to $900,000.

Light Well Fixtures Company, of 128 Broad Street, Elizabeth, N. J., has been incorporated at Trenton to manufacture electrical fixtures. The incorporators are Hyman Stocker, Moser Stocker and Ray Small, all of Paterson.

Fred F. Gloeckner, Inc., of Newark, N. J., has been incorporated at Trenton with $25,000 capital to deal in electrical supplies.

East Hollsman Iron and Metal Company, Inc., of Paterson, has been incorporated at Trenton with $50,000 capital to deal in iron and metals.—C. A. L.

DETROIT, MICH.

DECEMBER 1, 1923.

The brass, copper and aluminum business in Detroit shows a better trend than it has for a considerable time. It is being carried along with the automobile industry and has every indication of continued activity for an indefinite period. Manufacturers of automobile parts are particularly busy. The demand on them for increased production is urgent. More cars are being turned out of Detroit and Michigan plants than ever before. Everything looks good for an extremely active winter.

It is reported that automobile manufacturers are taking advantage of the present low price of copper to buy in anticipation of needs. In other lines it is said the demand for copper is falling off.

The **Gagnier Stereotype Foundry,** which formerly was located at 525 Howard street, has been moved to its new foundry buildings at 2423 McKinstry avenue. This gives the company, which is one of the oldest of the kind in the city, an opportunity to expand and to better care for its rapidly increasing business.

The **J. & S. Manufacturing Company** has been incorporated at Jackson, Mich., with a capital stock of $30,000 to engage in a general plating business. The principal stockholders are James P. Will, 448 Seward avenue; Clifford C. Johnson and George J. Seitz, all of Jackson.

A building permit has been issued to the **Stone Enameling Company,** 1831 West Fort street, for an addition to its building at 2515 Scotten avenue to cost $10,000.

The **Keeler Brass Company** at Grand Rapids, has been issued a permit for the erection of a factory building in that city at 234 Stevens street to cost $34,000.

It is stated that Detroit is now consuming 50 per cent of the copper production of the Lake Superior mines. This means that between 5,000,000 and 6,000,000 pounds of metal is shipped to the different plants in Detroit each month. Most of this metal goes into the manufacture of automobiles.

A new brougham is now being put out by the **Paige Motor Car Company** which is finished in baked enamel by a new process, providing a lasting luster, although the body is built on a hard wood frame. Heretofore, it has been thought impossible to produce a baked enamel finish on a body framed in wood—the heat of 400° F. necessary to give the lasting luster would melt the glue in the mortises or would warp even the best seasoned frames. By the new process used in the manufacture of this new Jewett body every metal panel is dipped and baked individually before being attached to the frame, the wood never being exposed to the heat. The panels which entirely sheath the new brougham receive three coats of enamel, three bakes, and three polishes.

It is announced that the **Marx Brass Works,** for the last few years known as the **Grant-Marx Works,** again are operating under the original firm name, under which they began activities in June, 1916, doing business at 688-692 Meldrum avenue.—F. J. H.

PITTSBURGH, PA.

DECEMBER 1, 1923.

Activities in the metal industry continued generally quiet throughout the state. A large tonnage of wire products orders was lined up last month but the pressure fell off somewhat

the last few weeks, and business is reported to be below production, although no large accumulation is being found in the mill yards.

The **Westinghouse Electric Manufacturing Company** for the quarter ended September 30 booked new business to the amount of $41,940,000 and billed out $38,619,500. These figures compare with the correspondence quarter of 1922, when the company booked $37,453,000 and billed out $32,291,800.—H. W. R.

INDIANAPOLIS, IND.

DECEMBER 1, 1923.

The **Indiana Brass** factory, Frankfort, Ind., is going well. A large force of workmen is employed and at the present time a lot of night work is being done in order to make delivery on certain contracts.

The newest industry at Michigan City, Ind., is the **Universal Plating and Manufacturing Company,** which has located in the building at 2019 South Franklin street. The concern, which has been installing machinery and tanks for some time began active operations recently, employing several men. The firm will do nickel, brass, copper, silver and gold plating. It is also equipped to do galvanizing work. **Joseph A. Hall,** president, was formerly in charge of the plating department of **Landers-Frary-Clark Company** at New Britain, Conn. The company has a large contract for silver plating for a mid-western chain of hotels.

Charles Hastings, Washington, Ind., for the last three years supervisor of the department of fabrication of metal at the **American Aluminum Company,** Edgewater, New Jersey, and **Miss Mildred Baer,** of Niagara Falls, were married, recently.

BIRMINGHAM, ENGLAND

November 20, 1923.

Apart from special circumstances there is a steady improvement in business in most of the metal trades. Much more work is being done in the rolling mills, the demand for sheet metal for a variety of purposes having considerably increased. Wire drawers are also well employed and the demand for tubes is increasing. The cheapening of cars and the success of the London shows has caused the aluminum founders and makers of parts and accessories for the motor-car and motor-cycle trades to get busy again. Electro-platers are experiencing a much improved demand, though chiefly for spoons and forks and other utility articles. Silversmiths have benefited by Xmas demands though not to the extent customary in former times. The jewelry trade has received a slight seasonal fillip, but the general level of business shows no prospect of immediate improvement. In brass foundry business, after some weeks of slackening, has begun again to improve, especially in exports to the British dominions. All scrap metals show increasing firmness.—G.

Business Items — Verified

Mueller Metals Company, Port Huron, Mich., will erect a forge shop at Port Huron.

Beginning December 1st, the **M. C. Modeling, Mold Making and Chasing Company,** 25-27 Third avenue, New York City, will occupy enlarged quarters at above address.

The office address of the **Bias Buff and Wheel Company, Inc.,** has been changed from 430 Communipaw avenue, Jersey City, N. J., to 8 West 40th street, New York City.

The **Crane Company,** 836 So. Michigan avenue, Chicago, Ill., states, in regard to its new foundry building, that it has not yet taken bids, and may not do so for some time to come.

James H. Rhodes & Company, Chicago, Ill., have opened a branch at 1099 Folsom Street, San Francisco, Calif. They have also just completed a new pumice stone mill in Long Island City.

Simmons Machine Tool Corporation, Albany, N. Y., has purchased the metal working equipment of the Pittsfield Machine & Tool Company, Pittsfield, Mass., for resale, and has already sold it.

The **Colonial Brass Works, Inc.,** Plainville, Conn., have moved into their new factory in Plainville, Conn. This concern manufactures brass and bronze valves, brass fittings and a general line of brass goods.

Walter E. Booth has sold his interest and that of the estate of his father, the late George Booth, in The Booth-Coulter Copper & Brass Company, Limited, to Messrs. Wm. Coulter, W. C. Coulter, and A. E. Coulter.

According to published reports, the plant formerly owned by the Hall Steam Pump Company, Pittsburgh, Pa., has been bought by the **Standard Sanitary Manufacturing Company,** Pittsburgh, Pa.

The **Federal Manufacturing Company,** Holland, Mich., reports that it expects to move into the new plant in January. Estimated cost $100,000. This firm operates the following departments: tool room, plating, japanning, stamping, polishing, lacquering.

Effective November 12, 1923, a new price of $58.00 is announced on the **Black & Decker** Half-Inch Special Portable Electric Drill. Another reduction is also announced on the Black & Decker Electric Valve Grinder. The new price is $34.00, former price having been $45.00.

The **Springfield Brass Company,** 821 West Main Street, Springfield, Ohio, will soon take bids for a new one-story foundry, estimated to cost $13,000, exclusive of equipment. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop.

The **Pacific Enameling & Manufacturing Company,** 880 60th street, Oakland, Calif., has plans for the construction of a new 1-story plant to cost approximately $12,000. This firm does porcelain enameling on steel and cast iron, both wet and dry process, such as signs, and stove parts, etc.

The **Twin City Brass & Aluminum Company** has erected a new plant at 1924 Washington Avenue, South, Minneapolis, Minn. The plant has a frontage of 65 feet and extends to a depth of 110 feet. It is equipped for a daily output of five tons of brass, bronze and copper castings, and three tons of aluminum castings.

The **Bassett Jewelry Company,** Providence, R. I., has awarded a general contract to the C. I. Bigney Construction Company, 184 Washington street, for the erection of a new plant at Baker street and Virginia avenue. This concern operates the following departments: tool room, plating, stamping, soldering, polishing.

The **Johnson Bronze Company,** New Castle, Pa., manufacturer of bronze bushings, etc., has awarded a general contract to the Truscon Steel Company, Youngstown, Ohio, for an addition to manufacture bushings under a special process. Equipment will be installed for about 75 operatives. This firm operates a stamping department.

The **Capitol Brass Company,** 2306 Franklin street, Detroit, Mich., will soon award the contract for the construction of a 3-story, 60 x 150 ft. brass factory. Estimated cost $100,000. This firm operates the following departments: brass, bronze foundry, brass machine shop, tool room, grinding room, casting shop, cutting-up shop, plating, stamping, polishing.

The **American La France Fire Engine Company,** Elmira, N. Y., with branch works at Bloomfield, N. J., for the manufacture of motor trucks, has disposed of a note issue of $2,000,000. This firm operates the following departments: bronze foundry, brass machine shop, tool room, grinding room, spinning, brazing, plating, japanning, tinning, soldering, polishing, lacquering.

The **Great Western Smelting & Refining Company,** 5205 Loraine avenue, Detroit, Mich., is building a new warehouse and smelting plant, approximately 200 x 270 ft., all on one floor with monitor roof construction. The total cost when completed will be approximately $250,000. The building will be ready for occupancy on March 1st. This firm operates a smelting and refining department.

The **Stanley Works,** New Britain, Conn., hardware, etc., will build a 60 x 100 ft. manufacturing unit on property adjoining the Stanley Rule & Level Company, subsidiary, and subsequently a 200-ft. addition to the main plant on Whiting street. This firm operates the following departments: smelting and refining, tool room, grinding room, cutting-up shop, galvanizing, plating, japanning, rolling mill, stamping, polishing, lacquering.

The **Mond Nickel Company, Ltd.,** of London, England, has just acquired the minority outstanding stock of the American Nickel Corporation, Clearfield, Pa., and is now its sole owner. Effective immediately W. L. Dethloff, formerly general manager of the American Nickel Corporation, becomes president and general manager, and S. J. McCabe assumes the duties of secretary and treasurer of this company. All business of the company will be conducted from the general office at Clearfield, Pa.

The **Follen-Lorenz Tool Works** has been organized at Kenosha, Wis., by James H. Follen and Frederick and Henry Lorenz to engage in engineering, tool and die jobbing, metal stamping and deep drawing, and the manufacture of a device for canceling checks, labels, etc. Most of the equipment required has been purchased, and is being installed in a three-story building on Avery street, Kenosha. This concern operates the following departments: tool room, grinding room, plating, stamping, polishing.

Andre Citroen of Paris, France, commonly called the "Henry Ford of France" is now building one of the most modern up-to-date foundries in Europe. It is quite a compliment to manufacturers of American foundry equipment that certain apparatus in the Citroen Foundry will be manufactured in the United States, including two No. 2, 6 ft. diameter **Simpson** Intensive Foundry Sand Mixers. These machines, manufactured by the National Engineering Company of Chicago will be exported to France for use in the Citroen Foundry.

Announcement is made at the offices of the **Ford Motor Company,** Detroit, of the acquisition of **C. E. Johansson, Inc.,** Poughkeepsie, N. Y., the American company engaged in the manufacture and sale of the Johansson gage blocks and measuring tools. The purchase also includes the sole American rights to the gages and the methods by which they are made. The Johansson gage blocks and other instruments will continue to be manufactured for the trade. Mr. Johansson, inventor of the gages, becomes a factory executive in the Ford organization. He arrived from Eskilstuna, Sweden, October 23, coming direct to Detroit, and has begun his work at the Ford Engineering Laboratory at Dearborn.

INCORPORATIONS

Irvine Brass & Copper Company, care of Corporation Service Company, Wilmington, Del., has been incorporated for $150,000. This concern will deal in goods, wares and merchandise.

Combined Brassfounders and Engineers, Inc., Queens, N. Y., has been incorporated with a capital of $20,000, to manufacture plumbing supplies, and will also handle any foundry job. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, plating.

The **General Metal Products Company, Inc.,** North West End and McKinley Avenues, Lancaster, Pa., recently incorporated with capital stock of $25,000, will cast high grade brass, bronze and aluminum work. A plant is being erected to take care of several tons of metal a day, in the three metals before mentioned. This firm will also specialize on matching, plate and pattern work, castings for automobile industry, name plates, bronze tablets and other allied products. This concern operates the following departments: brass, bronze and aluminum foundry.

BUSINESS TROUBLES

After conference with a number of the larger creditors, and at their request, a committee undertook to organize a representative creditors' protective committee to represent unsecured creditors and to formulate a plan of reorganization of the **McNab & Harlin Manufacturing Company.**

Notice has been given that on August 4, 1923, the **Benford Auto Products, Inc.,** Mount Vernon, New York, was duly adjudged a bankrupt, and that the first meeting of its creditors was held at the office of William C. Duell, referee in bankruptcy, Room 221, Court House Building, White Plains, New York, on December 3, 1923, at 2 o'clock in the afternoon.

At a meeting of creditors recently authority was given to the receiver to continue the business for a further period of thirty days. It was requested that creditors send in suggestions about plans of reorganization. Address all communications to the following, at room 1305, No. 27 William street, New York City. G. H. Creveling, Wickwire Spencer Steel Corporation; M. S. Billmire, Harriman National Bank; A. A. Fowler, Rogers, Brown & Company.

CENSUS OF LIGHTING FIXTURES, 1922

WASHINGTON, D. C., October 19, 1923.—The Department of Commerce announces that returns received from 521 establishments engaged in the manufacture of lighting fixtures show products to the value of $76,402,000 during 1922.

A lighting fixture is generally understood to be a device capable of being fixed or permanently attached to some supporting surface, by means of which incandescent electric bulbs, gas burners and mantles, and oil or other lamps may be utilized for illuminating purposes.

The lighting fixtures reported in the following table are arranged in five main groups, according to the purpose for which the fixtures are to be used, namely: commercial, residence, industrial, street, and marine lighting, followed by the auxiliary group "shades" as representing component parts of the complete fixtures. It will be seen by reference to the following table that the value of residence lighting fixtures constitutes 54.5 per cent of the total value of products reported. Of the 521 establishments reporting lighting fixtures, 254 manufactured home lighting fixtures; 178, table and floor lamps, and 109, reading lamps. The next group in importance is shades, with a product of $15,319,915, or 20 per cent of the total value reported for lighting fixtures. In this group the leading class is glass shades, with a product of $8,105,068.

MANUFACTURE OF LIGHTING FIXTURES—1922

Class of product	Number of establishments reporting	Value	Per cent of total
1. Commercial lighting fixtures:		7,267,941	9.5
Auditorium	67	1,825,390	
Operating and hospital	41	492,013	
Orchestra	14	125,525	
Store	105	3,058,213	
Window and showcase	40	1,246,321	
Stage	25	520,479	
2. Residence lighting fixtures:		41,621,505	54.5
Home lighting	254	24,234,471	
Table and floor lamps	178	12,222,814	
Reading lamps	109	5,164,220	
3. Industrial lighting fixtures:		7,718,846	10.1
Adjustable	13	311,005	
Car	16	2,087,358	
Office and drafting room	36	1,658,494	
Desk lamps	23	291,811	
Factory or industrial	46	3,370,178	
4. Street lighting fixtures:			
Street lighting	22	3,948,308	5.2
5. Marine fixtures:			
Marine lighting	22	525,678	.7
6. Shades:		15,319,915	20.0
Glass	69	8,105,068	
Parchment, paper and celluloid	28	310,299	
Silk, cretonne, linen, or other fabric	82	6,379,553	
Tin, aluminum, brass, or other metal	14	517,995	
Reed, rattan, or other wood form	2	7,000	
TOTAL		$76,402,193	100.0

NEW HUNGERFORD WAREHOUSE

The U. T. Hungerford Brass & Copper Company has moved into its new Boston building at 411-429 D Street. This is a spacious building with 270 ft. frontage on D Street and plenty of room to handle orders economically and with despatch. A covered shipping platform will accommodate five trucks at one time; overhead trolleys, electric hoists and other labor saving equipment facilitate loading trucks and getting them away quickly. In all there are 45,000 square feet of floor space with a total capacity of well over 15,000,000 pounds, permits carrying a materially increased tonnage and variety of brass, copper, nickel silver, bronze, etc., in sheet, tubes, rods, wire, rivets, nails, tacks, bolts, nuts, etc.

BOSTON WAREHOUSE OF U. T. HUNGERFORD COMPANY

HABIRSHAW REORGANIZATION

The reorganization plan and proposed sale of the Habirshaw Electric Cable Company were disapproved as being too expensive by United States Judge John C. Knox on a motion of the Independent Creditors' Committee. He based his disapproval on the grounds that he believed $1,000,000 would be sufficient for a reorganization rather than the $1,500,000 asked for in the plan; that the commission to be received by the underwriters was too large, and that the shares set aside for William F. Kenny, who was to be manager for the first eighteen months, were out of proportion to the value of an executive to a corporation of this size.

INTERNATIONAL NICKEL COMPANY

The International Nickel Company, for the six months ended Sept. 30, reported earnings of $1,273,714 against $417,379 in the same period last year. Surplus earnings were $496,324, equal, after preferred dividends, to 13 cents a share on the $41,834,600 common stock of $25 a share par value outstanding. In the same period last year the company reported a deficit of $106,828. The balance sheet of Sept. 30 showed a profit and loss surplus of $10,265,614.

TRADE PUBLICATIONS

Bronze and Copper Screen Cloth. A card issued by T. E. Conklin Brass & Copper Company, 54-60 Lafayette Street, New York, on its Tecco Brand bronze and copper screen cloth.

Baird Machines. A bulletin entitled, "Can the Prospect Pay Your Cost?" issued by the Baird Machine Company, Bridgeport, Conn., describing the Baird Tandem Press, the Automatic Four Slide, and the Steam Drying Out Barrel. This bulletin is also illustrated.

Mechanical Plating.—A booklet issued by B. Mercil & Sons Plating Company, 1907 Fulton street, Chicago, Ill., on mechanical plating and finishing. It contains illustrations of pieces plated mechanically and some general information about the treatment of mechanically finished work.

"Eye Hazards in Industrial Occupations," known as Publication No. 12 of the National Committee for the Prevention of Blindness, 130 East 22nd street, New York, first issued in 1917, has been revised, greatly enlarged, widened in its scope, brought up to date and will be ready for distribution about January 1, 1924.

Enamelist, No. 1.—A periodical for the porcelain enamel industry—issued by the Enamelist Company, 2100 B. F. Keith Building, Cleveland, Ohio. This number contains chapters on extracts from the history of the enamel arts, and of enamel ornamentation; fuel oil in the enameling plant; a good idea for pickle room; zirconium.

Self-propelled Electric Sand Cutting Machine.—Type HP-50. Bulletin No. 577, issued by the American Foundry Equipment Company, 366 Madison Avenue, New York, illustrating and describing its cutting, mixing and piling machine designed for medium duty conditions such as usually found in stove shops and light specialty foundries.

Walter C. Gold, Philadelphia, Pa., has issued the following catalogues—No. 1, Emery; No. 2, G. I. A. Discs and Accessories; No. 3, Grinding and Finishing Materials for Manufacturing Opticians; No. 4, Keystone Grinding Wheels; No. 5, Grinding and Finishing Materials for Monumental Works; No. 6, Finishing Materials for Cut Glass Works.

Year Book of the Merchants' Association of New York for 1923, issued by the Merchants' Association of New York, 233 Broadway, New York, covering the work done during the year ending May 1, 1923. The book includes alphabetical and classified lists of nearly 8,000 members of the Association and reports of the various committees for 1923.

Insulation—200 to 1500° F. Publication No. 1, issued by the Armstrong Cork & Insulation Company, Pittsburgh, Pa., covering the subject of insulation of high temperature apparatus such as is used by almost all industries—steam lines and equipment, ovens, furnaces, stills, cookers, kettles, sterilizers, etc., and is illustrated with view taken from many prominent plants.

Shear Blades and Knives. A folder announcing that A. W. Erickson has established and heads a new company of craftsmen, concentrating on the production of cutting tools for the steel, iron, metal-working, wood-working and paper industries. The name of the company is the Pioneer High Speed Machine Knife and Tool Company, and is located in Cleveland, Ohio.

Despatch Electric Ovens.—Catalogue IV issued by Despatch Manufacturing Company, Minneapolis, Minn., illustrating and describing their electric ovens for all purposes. Among the uses for these ovens are the following: annealing, bronzing, core baking, enamel drying and baking, japan baking and drying, jewelry manufacturers' ovens, lacquer baking and drying, steel bluing.

Doehler Die-Casting. A booklet issued by the Doehler Die-Casting Company, Brooklyn, N. Y., containing a brief review of the process, the evolution of Do-Di brass castings, engineering and metallurgical data, and a pictorial review of recent accomplishments. It also covers the design of dies, design of die-cast parts, inserts, cost of dies, die changes, life and maintenance of dies, cost of castings, etc.

Torchweld.—Catalogue No. 23, issued by the Torchweld Equipment Company, 224 N. Carpenter Street, Chicago, Ill., on its complete line of oxy-acetylene welding and cutting apparatus, lead welding, soldering, brazing and decarbonizing units, gas pressure regulators, automatic machines, generators and supplies. The catalogue contains cross sectional views of equipment with detailed explanation.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$465	$510
American Hardware Corporation	100	59	61
Anaconda Copper	50	38¼	38½
Bristol Brass	25	3	6
International Nickel, com.	25	11¾	11⅞
International Nickel, pfd.	100	78	80
International Silver, com.	100	60	...
International Silver, pfd.	100	103	107
National Conduit & Cable	100	¼	½
National Enameling & Stamping	100	40½	41
National Lead Company, com.	100	125	127
National Lead Company, pfd.	100	110½	113½
New Jersey Zinc	100	150	153
Rome Brass & Copper	100	115	125
Scovill Manufacturing Company, new	..	197	203
Yale & Towne Manufacturing Co., new	..	62	64

Corrected by J. K. Rice, Jr., Co., 36 Wall Street, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

The sudden change in the copper market in the early part of November brought about an increase in prices in fabricated brass and copper materials and created rather an unusual amount of activity compared with the condition that has prevailed for some months past. Many buyers who had been waiting for bottom prices before placing their orders came into the market with the result that heavy tonnages were booked by the mills. It is to be noted, however, that there was no disposition on the part of the sellers to take any contracts for deliveries very far ahead.

There is still to be seen a very cautious buying policy prevailing throughout the trade, and there appears to be no disposition on the part of any of the buyers to plunge heavily with a view to speculating on the market. As a result of this policy it is felt that a healthy condition still exists as most of the commitments were for definite orders and not of a speculative character. Consumers do not seem to have any idea that a runaway market in copper is possible under the conditions that prevail.

Throughout the trade a general feeling of satisfaction prevails. The mills are all reasonably busy and there are enough consumers who have adopted a hand to mouth buying policy coming into the market daily with new orders to keep a steady flow of business coming to the fabricators. Certainly this attitude marks a great improvement over the conditions which were prevalent in many of the periods of rising prices in the past, and leads to a healthier and more stable condition in the industry. The heavy consumers of copper and brass such as the manufacturers of automobiles and electrical equipment, as well as the building industry, still continue to operate on very broad and active lines, and the consumption in these trades remains at a high level. Most of the important factors in the industry look to the future with a very optimistic feeling and are making all their plans for a banner year in 1924.

In that branch of the non-ferrous metal industry which includes nickel and Monel metal there has been a continually increasing demand, with the result that the fabricators of these metals are also in a very contented frame of mind. Additional developments requiring their use have resulted in further large orders, which continues to be a source of gratification to the producers.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

A pronounced buying movement started in November which resulted in a rapid rise in market prices for all positions. Opening prices were on the electrolytic basis of 12⅝ cents per pound, but after two weeks of unusually heavy sales the market had advanced to 13½ cents. During the first half of the month developments were of a generally constructive character. There was a marked degree of strength displayed in both the New York and London markets, and buying for domestic and foreign account in large volume was a daily feature.

Total sales for the first half of November are estimated at over 200,000,000 pounds. Most of the business was for December, January and February deliveries. Important buying came to a sudden stop in the middle of the month, and since then prices have reacted to 12⅞c to 13c delivered. Signs of improvement were apparent at writing of our report. Inquiries are being renewed, with indications that cheap lots are disappearing. Sellers are all firmer and market quotes 13c to 13⅛c, delivered.

ZINC

Trade requirements are fairly good and substantial sales of zinc were recorded in November. The market has remained steady recently in spite of the fact that production has exceeded deliveries and an increase in stocks. For some time buyers follower the policy of hand to mouth buying, but consumers have displayed a little more confidence lately and moderate orders have been placed for delivery during first quarter of 1924. There is less pressure to sell as November closes and the market shows a slightly firmer tone at 6.30c E. St. Louis and 6.65c to 6.70c New York basis for Prime Western grades. There has been a considerable export outlet for zinc, but combined domestic and foreign demand is inadequate to take up production. Closing prices were firmer at 6.40c E. St. Louis and 6.85c New York.

TIN

Business has been active and prices strong in the tin market lately. At the beginning of November the New York price of Straits tin was 41⅞c and the London quotation £209 12s 6d, but by the middle of the month the New York market was on the basis of 42⅞c and London cables £218. During the second half of November the market was firm but irregular owing to the frequent fluctuations in sterling exchange. World's visible supply of tin increased 703 tons during October, but from present indications November statistics are expected to show a reduction in visible supplies. Deliveries in the United States for the first ten months of this year amounted to 58,559 tons, against 47,778 tons for the same months last year. Total domestic deliveries for the whole of 1921 were only 25,918 tons. American Sheet & Tin Plate Company were recently operating 95%, with sufficient orders booked to keep this plant running at 90% until next July. The week beginning November 26th opened with an advance in London to £232 per ton, or an advance of £8 10s over previous close. The New York market was firm but irregular at 46 to 47c.

LEAD

Consuming demand continues in good volume and the market has held firm all through November. Prompt and future deliveries find ready buyers and quotations have advanced to 6.85c New York and to 6.62½c St. Louis. Controling interests manage to keep the situation firmly in hand, and to avoid conditions detrimental to market firmness. Prompt and nearby shipments have sold as high as 6.67½c E. St. Louis, but primary hands are shading this quotation to steady customers. The New York basis is firm at 6.85c for December shipment. The statistical position of lead is favorable to market strength. There are no unwieldy stocks hanging over the market, and consumption furnishes a free outlet for the large volume of supplies available for trade requirements every month.

ALUMINUM

The market as a whole has moved up to a higher price range, but demand has not expanded in any pronounced degree apparently. The automotive industry uses large quantities of virgin aluminum in automobile bodies, castings, cylinders and other parts that enter into the manufacture of automobiles. Demand for aluminum in this trade is on the increase, especially since more closed cars are being made. Market prices for 99% plus virgin ingot are 27c to 27½c. The 98-99% quality quotes 26c to 26½c, delivered terms.

British and Swiss makers sold moderately, but offers of French or German aluminum were withheld lately.

ANTIMONY

Consuming demand has been in fair volume lately and the general position of antimony is considered favorable to a steady market tone. Chinese offerings are made with considerable reserve. Recent options for early 1924 shipment were at 6½c to 6¾c c. i. f. in bond. Spot regulars quotes 8.80c to 9c at New York, duty paid. There is a limited tonnage afloat seeking a market, but direct offerings from China are held at full prices. Buyers, however, show only moderate interest.

QUICKSILVER

Prices quoted $60 to $62 per flask. The market tone is quiet and easy. Sellers find demand slow, and only small lots appear to be moving into consumption. Recent foreign offers indicated more keen desire for orders at slight concessions in price. London cables quote £9 15s.

PLATINUM

The domestic price of refined platinum is quoted at $125 per ounce. Supplies are limited and holders have been able to mark up quotations recently.

SILVER

The silver markets of the world have been on a firmer basis lately. Supplies in China have been reduced to comparatively small dimensions, although the stock held in India is reported somewhat large. There has been some reduction, however, in the holdings at Bombay within recent weeks. Chinese demand expanded noticeably during first half of November and supplies at Shanghai, as result, of new requirements, underwent considerable reduction. The silver producers' association held its first meeting in New York on November 14th. The proceedings of the session were held in private and no statement was made public. It is understood, however, that efforts will be made to make New York the primary market for silver and to exercise export control through improved shipping service so that new agencies may be secured for the sale of the product produced in this country. Price of silver bullion on November 26th was quoted at 65⅛c spot and 64½c futures.

OLD METALS

The November opening was extremely dull and depressed, but buying of scrap metals improved noticeably around the middle of the month due to the activity and firmness in new metals. Both manufacturers and dealers re-entered the market and fair quantities of copper scrap, new brass clippings and lead scrap changed hands. Export business also developed on a moderate scale. A fresh display of caution, however, was manifest lately, but this is regarded as the logical result of recent weakness in the market for new copper. The local scrap market is therefore quiet pending developments in primary metals. Buying prices quote 11c to 11½c for strictly crucible copper, 5½c to 6c for heavy brass, 8c to 8¼c for clean red car boxes, brass clippings 7¾@8¼c, heavy lead 5¾@6c, old zinc scrap 4@4¼c and battery lead 3.65@3.75c.

WATERBURY AVERAGE

Lake Copper—Average for 1922, 13.844—January, 1923, 14.875—February, 15.75—March, 17.25—April, 17.125—May, 16.125—June, 15.25—July, 15.00—August, 14.50—September, 14.00—October, 13.25—November, 13.375.

Brass Mill Zinc—Average for 1922, 6.283—January, 1923, 8—February, 8—March, 8.70—April, 8.25—May, 7.60—June, 7.00—July, 6.80—August, 7.10—September, 7.30—October, 7.10—November, 6.80.

Daily Metal Prices for the Month of November, 1923

Record of Daily Highest, Lowest and Average

Metal Prices for December 3

	1	2	5	*6	7	8	9	12	13	14	15	16	19
Copper (f. o. b. Ref.) c/lb. Duty Free.....													
Lake (Delivered)	13.00	13.00	13.00	.....	13.00	13.25	13.50	13.625	13.75	13.75	13.625	13.50	13.50
Electrolytic	12.70	12.65	12.65	.....	12.75	12.90	12.125	13.25	13.30	13.25	13.25	13.125	13.00
Casting	12.375	12.375	12.375	.....	12.50	12.625	12.75	13.00	13.00	13.00	13.00	12.875	12.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.....													
Prime Western	6.35	6.35	6.35	.....	6.35	6.40	6.40	6.45	6.45	6.45	6.40	6.35	6.30
Brass Special	6.45	6.45	6.45	.....	6.45	6.50	6.50	6.55	6.55	6.55	6.50	6.45	6.45
Tin (f. o. b., N. Y.) c/lb. Duty Free.....													
Straits	41.875	41.625	41.875	.....	43.375	43.25	43.00	43.50	44.375	43.75	42.75	42.875	43.625
Pig 99%	41.375	41.25	41.50	.....	43.00	42.875	42.75	43.125	44.00	43.375	42.50	42.625	43.25
Lead (f. o. b., St. L.) c/lb. Duty 2½c/lb	6.45	6.45	6.45	.....	6.50	6.50	6.50	6.55	6.60	6.70	6.70	6.65	6.65
Aluminum c/lb. Duty 5c/lb.	26.50	26.50	26.50	.....	26.50	26.50	26.50	26.50	26.50	26.50	27.50	27.50	27.50
Nickel c/lb. Duty 3c/lb.....													
Ingot—Internat. Nick. Co.....	29	29	29	.....	29	29	29	29	29	29	29	29	29
Outside Spot	28	28	28	.....	28	28	28	28	28	28	28	28	28
Electrolytic (Internat. Nick. Co.).....													
Ni.—99.80 contam. impur.—.14.....	32	32	32	.....	32	32	32	32	32	32	32	32	32
Brit.-Amer. Nick. Corp.....													
Ni.—98.50 contam. impur.—.80.....	29	29	29	.....	29	29	29	29	29	29	28	28	28
Antimony (J. & Ch.) c/lb. Duty 2c/lb.....	9.00	9.00	9.25	.....	9.25	9.25	9.25	9.25	9.25	9.25	9.25	9.00	9.00
Silver (foreign) c/oz. Duty Free.....	63.375	63.00	63.625	.....	63.375	63.50	63.25	64.125	64.625	63.625	63.25	63.375	64.00
Platinum $/oz. Duty Free..	120	120	120	.....	120	120	120	125	125	125	125	125	125

	20	21	22	23	26	27	28	*29	30	High	Low	Aver.	Dec. 3
Copper (f. o. b. Ref.) c/lb. Duty Free.....													
Lake (Delivered)	13.50	13.25	13.25	13.25	13.25	13.375	13.375	.....	13.25	13.75	13.00	13.350	13.25
Electrolytic	13.00	12.75	12.75	12.75	12.875	13.00	13.00	.....	13.00	13.30	12.65	12.954	13.10
Casting	12.75	12.50	12.50	12.50	12.625	12.75	12.875	.....	12.875	13.00	12.375	12.700	12.875
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.....													
Prime Western	6.30	6.30	6.30	6.30	6.40	6.40	6.40	.....	6.40	6.45	6.30	6.370	6.35
Brass Special	6.40	6.40	6.40	6.40	6.50	6.50	6.50	.....	6.50	6.55	6.40	6.473	6.45
Tin (f. o. b., N. Y.) c/lb. Duty Free.....													
Straits	43.75	44.50	44.125	44.25	46.125	46.25	47.00	.....	47.125	47.50	41.625	44.100	47.375
Pig 99%	43.75	44.50	44.125	44.25	46.125	46.25	47.00	.....	46.75	47.00	41.25	43.719	46.875
Lead (f. o. b., St. L.) c/lb. Duty 2½c/lb.....	6.65	6.65	6.65	6.70	6.70	6.70	6.75	.....	6.85	6.85	6.45	6.618	7.00
Aluminum c/lb. Duty 5c/lb.	27.50	27.50	27.50	27.50	27.50	27.50	27.50	.....	27.50	27.50	26.50	27.050	27.50
Nickel c/lb. Duty 3c/lb.....													
Ingot—Internat. Nick. Co.....	29	29	29	29	29	29	29	.....	29	29	29	29	29
Outside Spot	28	28	28	28	28	28	28	.....	28	28	28	28	28
Electrolytic (Internat. Nick. Co.).....													
Ni.—99.80 contam. impur.—.14.....	32	32	32	32	32	32	32	.....	32	32	32	32	32
Brit.-Amer. Nick. Corp.....													
Ni.—98.50 contam. impur.—.80.....	28	28	28	28	28	28	28	.....	28	29	28	28.450	28
Antimony (J. & Ch.) c/lb. Duty 2c/lb.....	9.00	9.00	9.00	9.00	8.95	8.95	8.90	.....	8.85	9.25	8.85	9.083	8.75
Silver (foreign) c/oz. Duty Free.....	63.875	64.375	64.125	64.25	64.50	64.00	64.125	.....	64.375	64.625	63.00	63.838	64.375
Platinum $/oz. Duty Free..	125	125	125	125	125	125	125	.....	125	125	120	123.50	125

* Holiday.

Metal Prices, December 3, 1923

INGOT METALS AND ALLOYS

Brass Ingot, Yellow	9½to11
Brass Ingots, Red	11½to13½
Bronze Ingot	13 to14
Bismuth	$2.75
Cadmium	80 to85
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$3.00
Manganese Bronze Castings	22 to35
Manganese Bronze Ingots	13 to16
Manganese Bronze Forging	33 to42
Manganese Copper, 30%	28 to45
Magnesium Metal	$1.25–1.50
Parsons Manganese Bronze Ingots	18 to19½
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	18 to21
Phosphor Copper, guaranteed 10%	17½to21
Phosphor Tin, guranteed 5%	55 to60
Phosphor Tin, no guarantee	52 to58
Quicksilver	$62
Silicon Copper, 10%.....according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
11 to11¼	Heavy Cut Copper	12½to13
10½to10¾	Copper Wire	12 to12¼
9 to 9¼	Light Copper	10¼to10¾
9 to 9¼	Heavy Machine Comp	10½to11
6¼to 6½	Heavy Brass	8½to 9
5 to 5½	Light Brass	6¼to 6¾
6½to 6¾	No. 1 Yellow Brass Turnings	7¼to 8¼
8¼to 8½	No. 1 Comp Turnings	9 to 9¾
5¾to 6¼	Heavy Lead	6¼to 6½
2¾to 3½	Zinc Scrap	3¾to 4¼
8¼to 8¾	Scrap Aluminum Turnings	10¾to11¼
14¼to14¾	Scrap Aluminum, cast alloyed	16¼to16¾
15¼to16¼	Scrap Aluminum, sheet (new)	17¼to18¼
22¼	No. 1 Pewter	26¼
13¼	Old Nickel anodes	15¼
21¼to23¼	Old Nickel	25¼to27¾

BRASS MATERIAL—MILL SHIPMENTS

In effect Nov. 13, 1923

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.17¾	$0.19½	$0.21¼
Wire	0.18¼	0.20	0.21¾
Rod	0.15½	0.20¼	0.22
Brazed tubing	0.25¾	.....	0.31
Open seam tubing	0.25¾	.....	0.31
Angles and channels	0.28¾	.....	0.34

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.18¾	$0.20½	$0.22¼
Wire	0.19¼	0.21	0.22¾
Rod	0.16½	0.21¼	0.23
Brazed tubing	0.26¾	.....	0.32
Open seam tubing	0.26¾	.....	0.32
Angles and channels	0.29¾	.....	0.35

SEAMLESS TUBING

Brass, 22c. to 23c. per lb. base.
Copper, 23½c. to 24½c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	19¾c. net base
Muntz or Yellow Metal Sheathing (14"x 48").	17¾c. net base
Muntz or Yellow Rectangular Sheets other Sheating	18¾c. net base
Muntz or Yellow Metal Rod	15¾c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	21c. to 22c.
From stock	22c. to 23c.

BARE COPPER WIRE—CARLOAD LOTS

15⅞c. to 16c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	19¾c. per lb. base
100 lbs. to 200 lbs. in one order	20¼c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9¼c. basis less 8 per cent. discount.

Casks, jobbers' prices	10¾c. to 11½c.
Open casks, jobbers' prices	11½c. to 12½c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	37c.
Aluminum coils, 24 ga. and heavier, base price	35c.
Foreign	36-38c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	25¼c. per lb.
15%	"	26¾c. per lb.
18%	"	28c. per lb.

Nickel Silver Wire and Rod

10%	"	28½c. per lb.
15%	"	32c. per lb.
18%	"	35c. per lb.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Hot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheets—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 67½c. to 69½c. per Troy ounce, depending upon quantity.

Rolled sterling silver 65c. to 67c.

NICKEL ANODES

85 to 87% purity	37½c.-39½c. per lb.
90 to 92% purity	40c-42c. per lb.
95 to 97% purity	42c.-44c. per lb.

Supply Prices, December 3, 1923

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	.24½–.27
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.45–.50
Denatured in bbls.	gal.	.51–.55
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02½–.03
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech., Barrels	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.07
Chrome Green, bbls	lb.	.39¼
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.20
Cyanide	lb.	.46
Sulphate, Barrels	lb.	.05½
Copperas (Iron Sulphate, bbl.)	lb.	.02
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	6.75
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate, see Copperas, bbl.	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22½–.40
Salts, single bbls.	lb.	.11½
Salts, double, bbl.	lb.	.10½
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.09
Potassium Bichromate casks	lb.	.10¼
Carbonate, 80-85%, casks	lb.	.06
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	1.08
Nitrate, 100 ounce lots	oz.	.44½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls.	lb.	.06
Cyanide, 96 to 98%, 100 lbs.	lb.	.23
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls.	lb.	.03
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass) bbls.	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.21–.13
Sulphur (Brimstone) bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.32½
Tripoli	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls.	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls.	lb.	.13–.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb.	.37
Cyanide	lb.	.37
Sulphate, bbls.	lb.	.03¼

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	46.50
14 inch, 20 ply, 64/68, cloth	base,	57.80
12 inch, 20 ply, 84/92, cloth	base,	45.00
14 inch, 20 ply, 84/92, cloth	base,	60.60
12 inch, 20 ply, 88/96 cloth	base,	51.05
14 inch, 20 ply, 88/96, cloth	base,	68.80

Sewed Buffs, per lb., bleached and unbleached....base, .65 to .75

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.75	2.50
" 6" 8" and over 16"	1" to 3"	2.85	2.60
" 6" to 24"	Over 3"	3.15	2.80
" 6" to 24"	½" to 1"	3.75	3.50
" 4" to 6"	¼" to 3"	4.75	Any quantity
" Under 4"	¼" to 3"	5.35	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.

The Previous Bullish Stand That We Have Taken

relative to present business has been sustained.

The action of Wall Street is generally the forerunner of business conditions.

Quietude in the Foundry is now a thing of the past. While conditions were sluggish, the present indications are that there is a strong demand from Railroads and Motor Car Builders for equipment.

We believe that the period from December 1st to at least July 1st, 1924, will be a record breaker in the way of business. We have had strong faith in this position, and are now prepared to execute your orders.

TILTING CRUCIBLE FURNACE—OIL OR GAS—MOTOR BLOWER

Immediate shipment for

MONARCH MODERN FURNACES, CORE OVENS, ETC.

The stability of our faith is sustained by our 20 years of successful manufacture. Our reputation is your guarantee.

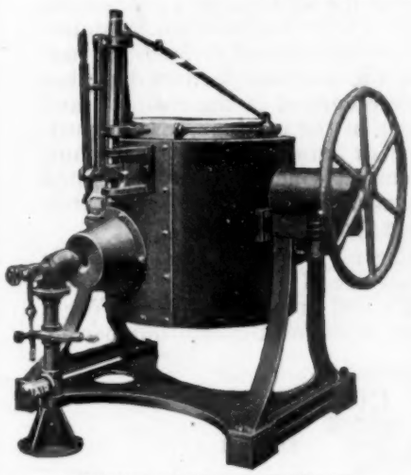
We manufacture a complete line of

METAL MELTING FURNACES.
CORE OVENS.
PUMPS.
BLOWERS.
CUPOLA LIGHTERS.
LADLE HEATERS.
OIL & GAS BURNERS.
SMELTING AND REVERBERATORY FURNACES

and in fact any Melting Furnace for oil, gas, coal or coke.

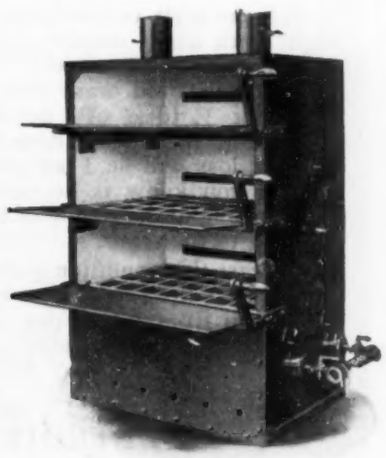
REVOLVING FURNACE—MOTOR DRIVEN
For Melting Brass, Copper, Gold, Silver and Other Metals and Alloys

Catalogue TMI-12-1923.



TILTING CRUCIBLE FURNACE

STATIONARY CRUCIBLE FURNACE—LOW AIR. COMBUSTION CHAMBER



CORE OVENS—ALL FUELS AND SIZES
For Foundry Cores

MANUFACTURED BY

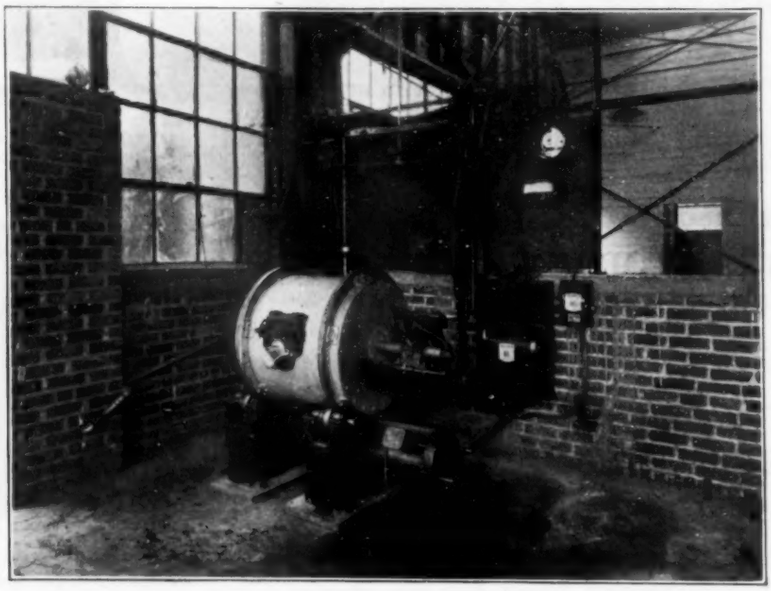
The Monarch Engineering & Mfg. Co.

1206 American Building

BALTIMORE, MD. U. S. A.

Works—CURTIS BAY, MD.

You can reduce metallic losses to less than 1 per cent. with Detroit Electric Brass Furnaces



Type L-F 200-250-lb. Furnace at Federal Bearing and Bushing Co. Detroit

You can melt yellow brass (60-40) scrap or ingot with a net metallic loss of less than 1 per cent in a Detroit electric brass furnace. You can melt red brass scrap with losses not exceeding ½ to ¾ of 1 per cent. Even with yellow oily turnings or even grindings the net metallic loss will be 3 per cent or under—and this as you know is necessarily a minimum figure owing to the weight of the foreign matter clinging to the scrap.

Contrast this condition with that obtained in oil and coke fired furnaces where your metallic losses run from 3 to 8 per cent or more, and you will have a fair idea of the economies which Detroit Electric Furnaces effect in this one phase of operation. Of equal importance and from the standpoint of economical operation is the practical elimination of defective castings—a result secured through the perfect mixing of the rocking furnace together with the complete control of the chemical and physical qualities of the castings. No impurities from the fuel or linings such as the sulphur, silicon, and alumina, which occur with oil and coke fired furnaces, are found in Detroit Electric Furnace operation.

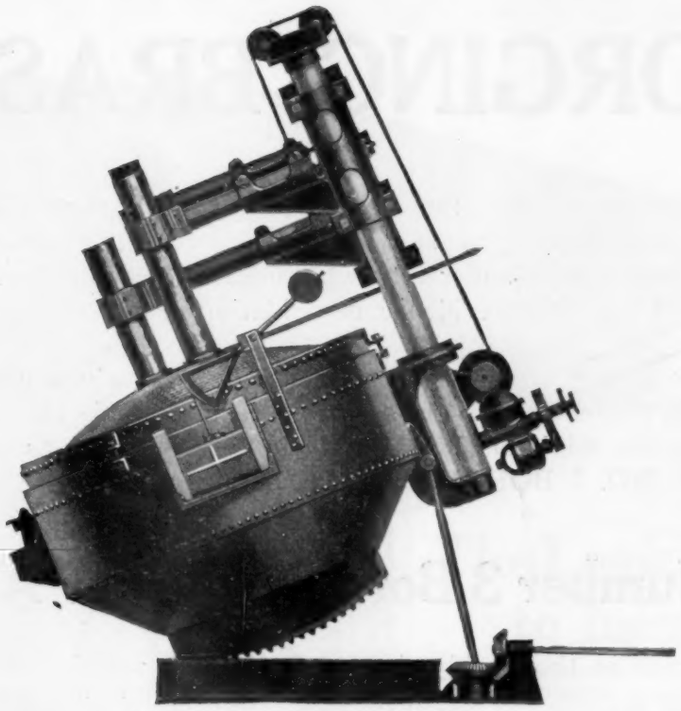
There is a size for every service. You can profitably install one if you melt 500 pounds or more of brass and bronze per day. To get the whole story write for Bulletin number 45.

DETROIT ELECTRIC FURNACE COMPANY

645 Book Building **Detroit**

Ask the man who uses one

DETROIT ELECTRIC FURNACES



The Metal Melting and Refining Type

Excellence of manufacture and design, together with the exclusive slag resistance method, combine to make Wile furnaces of outstanding efficiency.

Although for iron and steel the straight arc is used, for many metals the slag resistance bath is preferable, since it keeps the metal from contact with overheated arcs, as no arcs are used. The metal is charged into the furnace and sinks beneath the bath of slag. Melting is accomplished by the resistance of the slag to the path of the current.

This method makes for clean metal by removing into the slag all the oxides contained in the metal. No gas pockets are formed when the metal is cast, thereby making denser and sounder castings. This effects a considerable saving by reducing the loss from unsound castings.

Complete information is contained in our Booket "J."

WILE ELECTRIC FURNACES

WILE ELECTRIC FURNACE & ENGINEERING CO.
50 Church Street **New York City**
Cable Address—Wilefurn, New York

FORGING BRASS

The exact mixture of Brass that will submit to forging or rolling has always been regarded as a specialty by those closely associated with the work. The melting and casting must be held under very close limits to provide slugs that are free from spongy spots and other evidence of oxidation.

Very serious losses are often sustained when the slugs are found unfit and the metal fails to size up to the proportions required to fill the dies. This loss may be reduced to the minimum by carefully following directions which we give **"HOW TO USE NO. 3 BORONIC COPPER ALLOY."**

The Number 3 Boronic Copper Alloy

is a specific that will so thoroughly cleanse the molten metal, removing all impurities, producing a clean homogeneous slug, thoroughly qualified for drawing out into bars or forging in a die.

A Large List of Boronic Specifics

to meet the need of almost every requirement is now offered to the Foundry Trade, BRASS Forging Shops or Bar Mills, each specific being described in our Booklet announcing its purpose. Special service is offered by our associates and we invite correspondence and inquiries by telephone, telegraph or letter.

Send for Booklet, Address—

To the Individual Mixer of Metals:
PLEASE USE THIS COUPON

American Boron Products Co., Inc.,
Reading, Penna.

Gentlemen:—Kindly send me complete details regarding the many ways whereby I can economize by using Boronic Alloying Metals.

M.I.-12-23

MY HOME ADDRESS IS:

Name .....

City .....

State .....

American Boron Products Co., Inc.

(Sole Manufacturers)

READING, PA. U. S. A.

The Logical Way to Insulate

Walls and arches of furnaces and ovens must be insulated, and yet they should be of solid construction, not weakened by air spaces and loose fillings. How can it be done?

Simple enough: With insulation in brick form—Nonpareil Insulating Brick. Lay them up back of the firebrick, in the middle of the wall or outside; bond all courses together, and you have the only logical insulation for brick-set equipment—solid construction with the insulation built in.

Made of diatomaceous earth by a process that eliminates the natural layer formation, Nonpareil Brick are uniform in structure, strength and heat-retarding value. They stand shipping and handling with practically no breakage, lay up evenly and do not split or spall.

And they *insulate*. A single 4½-inch course saves two-thirds of the heat that would be lost through uninsulated construction.

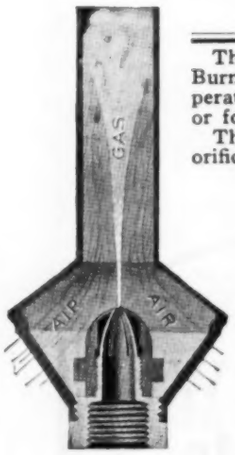
Sample brick sent on request with a 72-page book on heat insulation—"Nonpareil Insulating Brick." Write for them.

Armstrong Cork & Insulation Company
116 Twenty-fourth Street
Pittsburgh, Pa.

Nonpareil Insulating Brick

For Furnaces, Ovens, etc.

Why the JOHNSON Patented
Direct Jet Regulator
Makes Forced Air Blast Unnecessary



The Johnson Auto-Blast Bunsen Burners develop 2250° F. flame temperature without the use of blower or forced draft of any kind.

The high jet velocity at the gas orifice, caused by the Johnson Patented Direct Jet Regulator, and the force with which a clean, solid jet of gas is projected down the center of the mixing tube, insures the admixture of the maximum percentage of air.

Burners furnished in two styles and sizes, singly or mounted in any shape to suit your requirements.

For metal melting Pots, Heaters, Ovens, or any place a high temperature is required.

Send for descriptive circular.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Rep., C. P. Babcock Co., 768 Mission St., San Francisco, Cal.

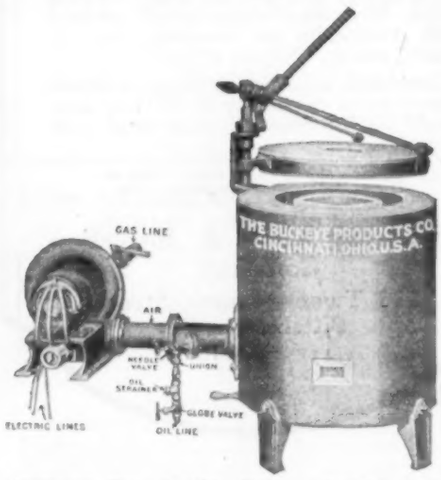
NON-OXIDIZING
ANNEALING FURNACES

OIL, GAS OR ELECTRIC HEATED. BUILT IN CAPACITIES OF FROM A FEW OUNCES TO SEVERAL TONS.

SEND FOR BULLETINS.

CHARLES F. KENWORTHY
INCORPORATED
WATERBURY, CONN.

BUCKEYE FURNACES
Stationary, Worm-Geared Tilting, Crucible and Non-Crucible for Oil or Gas Fuel.



Stationary Type Crucible Furnace, Complete Unit

Manufactured by

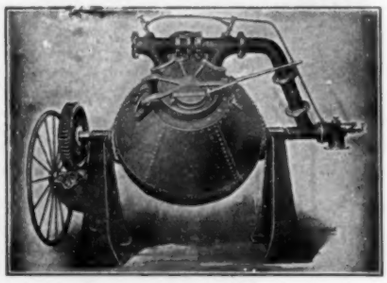
THE BUCKEYE PRODUCTS COMPANY
Foundry Facings, Supplies, Equipment, Core Oils and High Temperature Refractory Cements.

917-925 W. Fifth St., Cincinnati, O., U. S. A.

The One Real Solution of Your Melting Problems

THE

HAWLEY-SCHWARTZ FURNACE
Enemy of High Cost Melting!



Investigate the Hawley-Schwartz before ordering high-cost electric installations. It eliminates crucibles and crucible troubles — prevents volatilization losses — melts more metal with less men.

CATALOG M-1 SENT ON REQUEST

HAWLEY-DOWN DRAFT FURNACE CO.
EASTON, PA.

Comfort for the Moulders

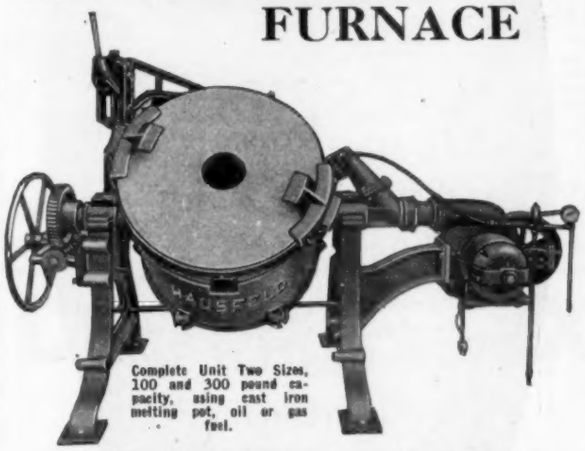
Comfort that pays dividends—not merely in better health but in bigger output of higher quality.

Fresh air and light are two of the biggest factors in a brass foundry's success. This booklet tells how to get them by right selection of the sash and roof design.

DAVID LUPTON'S SONS CO.
2235 E. Allegheny Avenue
Philadelphia

Makers of Steel Sash for Industrial Buildings

HAUSFELD
CRUCIBLE MELTING FURNACE



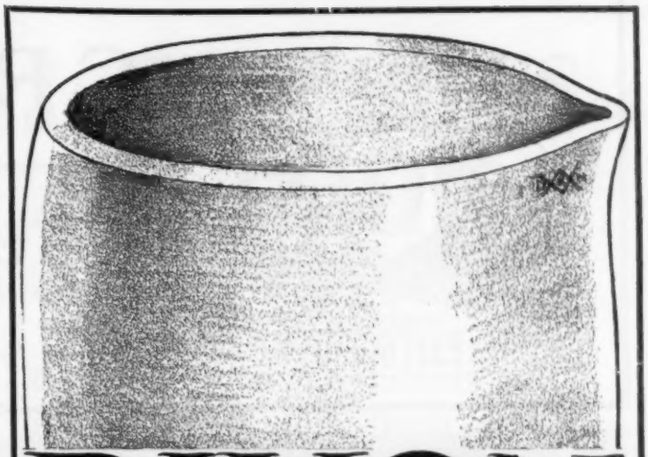
Complete Unit Two Sizes, 100 and 300 pound capacity, using cast iron melting pot, oil or gas fuel.

Hausfeld Furnaces have been tested by time. Correctly designed to meet that severest of tests, the lowering of costs and the boosting of production, they have proven their value through years of service.

May we send you full information?

Manufactured only by

THE CAMPBELL-HAUSFELD CO.
GENERAL OFFICES AND WORKS:
HARRISON, OHIO, U. S. A.



DIXON GRAPHITE CRUCIBLES

The Quality You Can Trust

There need be no worry about crucible trouble in the middle of a melting operation if the crucible you use bears the Dixon name.

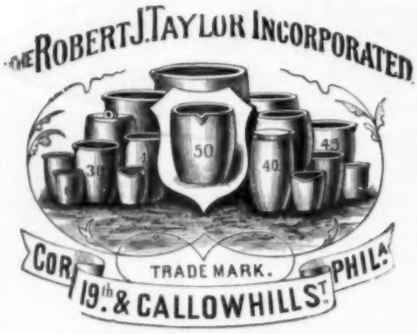
You can depend upon Dixon Crucibles to withstand heat after heat for an unusually long time under the most trying conditions.

There's a Dixon Crucible for every Metallurgical Requirement.

We made the first successful "blacklead" crucible in 1827 and have ever since maintained a standard of efficiency and dependability that has made our product the first choice of successful foundrymen.

What are YOUR requirements?
See Booklet No. 12A

Joseph Dixon Crucible Co.
Jersey City, N. J.
Established 1827



CRUCIBLES

ROBERT J. TAYLOR

Incorporated

1900 to 1916 Callowhill St., PHILADELPHIA, PA.

OUR every effort is bent to produce the very best crucibles possible—best materials and most expert and painstaking manufacture. The result is a crucible that saves its buyer money. Will you test it? Write for prices.

McCullough - Dalzell Crucible Co.
PITTSBURGH, PA.

THE STANDARD IN CRUCIBLES

FOR
OVER 60 YEARS

J. H. GAUTIER & CO.
JERSEY CITY, N. J.

VICTORY B-42 CRUCIBLES

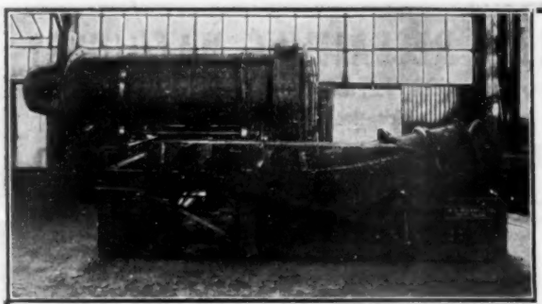
Made by the Lawton Process

Contain just the right proportion of Ceylon Flake Graphite, carefully mixed and wrought with other high-grade ingredients to produce crucibles that are good conductors of heat, highly resistant against molten metal, long-lived and able to withstand sudden shocks from the rapid temperature changes to which most crucibles are subjected.

Jonathan Bartley Crucible Co.
Trenton, New Jersey, U. S. A.

REPRESENTATIVES

J. E. ROBERTSON, Martin Building, El Paso, Texas
E. D. BULLARD CO., 219 Hansford Block, San Francisco, Cal.
A. C. MOULTON, 206 So. West Temple St., Salt Lake City, Utah.
BRAGG ENGINEERING CO., 12-253 General Motors Building, Detroit, Mich.



Automatic Rotary Furnace and Quenching Tank

AUTOMATIC HEATING AND COOLING IMPROVES PRODUCT—LOWERS COST

The ideal method of heating and cooling is to expose each piece to the same temperature, for the same time, at the same rate, and in the same manner.

Such uniformity, with resultant economy, is most easily attained by automatic heating and cooling, especially when conducted with

ROCKWELL AUTOMATIC ROTARY FURNACE AND QUENCHING TANK

In heating, the pieces are charged into the charging drum of the furnace in bulk, and a definite number are taken into the furnace at each revolution. The pieces are gradually and automatically WORMED through the furnace, at a fixed speed, to the discharge end, where they reach the desired temperature and are automatically discharged into the quenching tank.

In cooling, as in heating, the slow turning and mixing action of the pieces in the helical runway affords individual and continuous quenching.

You need this ideal heating-cooling unit if your material is of such size and shape as will permit of this method of handling. ***Write nearest branch for Bulletin No. 245-B***

W. S. ROCKWELL CO. 50 Church St., New York

Branches: Chicago, Ellsworth Bldg. Cleveland, Engineers' Building Detroit, Majestic Building Montreal, Can., 234 Beaver Hall Hill
British Representative: Gibbons Bros., Ltd., Dudley, Worc., England

DURA-STIX

Plastic Bonding Mortar

KEY-FRAX

Dry High Temperature Cement

CRUNDUMSAND

For One-Piece Linings

KEYSTONE REFRACTORIES CO.
120 Liberty Street, New York

Furnace Linings

Ramming in Lining

for all types of non-ferrous melting furnaces. No need for special, carefully fitted shapes.

You just use a plastic mixture of **CARBOSAND and HYTEMPITE** (following carefully our instructions for mixing) and ram it into place between furnace shell and collapsible form of wood or metal.

Ask for Folder CM

Quigley Furnace Specialties Co., Inc.
26 Cortland St. New York

Hytempite is carried in stock by our agents from Coast to Coast

MACK-H. T.

MACK-H. T. Cement sets up hard without heat, and instead of disintegrating or crumbling under heat as fire clay does, it welds the bricks together, thereby assuring a permanent bond under all temperatures.

HIGH TEMPERATURE FIRE BRICK
Bonding Cement

FOR
BOILER SETTINGS
FURNACE LININGS
CUPOLAS

FOR
LADLES, RETORTS
AND OPEN FLAME
FURNACES

MACK-H. T. Cement resists the abrasive action of flames and is not swept out of the seams by high velocity gases in oil furnaces. It is your insurance of gas tight walls.
Try it now and you'll always use it.

FOUNDRY FURNACES

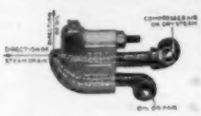
MACK ENGINEERING & SUPPLY CO., Inc.
REFRACTORY ENGINEERS
134 Liberty Street, New York, N. Y.

One of the quickest methods of raising your profits is to instal a few Type D ELECTRIC

NORTHERN HOISTS

NORTHERN ENGINEERING WORKS.
DETROIT, MICH. U.S.A.
(Makers of Northern Cranes)

METAL RECLAIMING MACHINERY
ALSO FURNACES, REFRACTORIES, OIL BURNERS, ETC.
Write for special bulletins
THE MINE & SMELTER SUPPLY CO.
42 Broadway, New York City



THERE'S NOTHING BETTER THAN THE "BEST"
Oil Burners for every class of service, including Furnaces for Melting, Refining and Annealing of Metals.
W. N. BEST Corporation
No. 11 Broadway New York City

INDICATING

Tycos
temperature instruments

RECORDING

CONTROLLING

are indispensable to the manufacturer who uses high temperatures. Investigate *Tycos:*
Indicating and Recording Pyrometers.
Automatic Pyrometer Controls.
Signalling Pyrometers. Optical Pyrometers.
Fery Radiation Pyrometers.
Pyrometer Accessories. Thermocouples.
Request Catalog Part 4000.

Taylor Instrument Companies
Rochester, N.Y. U.S.A.
There's a *Tycos* and *Taylor* temperature instrument for every purpose 350

Crucibles

ROSS-TACONY CRUCIBLE CO.
TACONY
PHILADELPHIA, PA.
Established 1871

EFFICIENT
Gas - INDUSTRIAL - Oil
FURNACES
Uniform Temperature Maximum Output
Minimum Fuel Cost
THE SURFACE COMBUSTION CO.
364 Gerard Ave., Bronx, New York, N. Y.
PHILADELPHIA PITTSBURGH CHICAGO

LAVA CRUCIBLES

"MOST METAL PER DOLLAR"

Why is it that when crucible records are mentioned, the results are almost invariably reported in comparison with "Lava"?

Because "Lava" is the Standard of Comparison.

"Lava" success has been gained through having in the first place the proper principle of crucible construction, and then everlastingly striving for improvements on this one basic principle. And so "Lava" pots are getting better every day.

"Lava" pots are the best pots made today, and when a better pot is made, "Lava" will make it.

Modern type crucible furnaces equipped with "Lava" crucibles are the most efficient, flexible, and economical units obtainable; and the initial cost is ridiculously low compared with other equipments.

Lava Crucible Co. of Pittsburgh
PITTSBURGH

SALES REPRESENTATIVES
THE S. OBERMAYER CO.
CHICAGO (Warehouse) NEWARK CINCINNATI
ST. LOUIS MILWAUKEE
CUTTER & WOOD SUPPLY CO.
BOSTON
The Dominion Foundry Supply Co., Limited
MONTREAL (Warehouse) *TORONTO* (Warehouse)

The Metal Industries use and we sell:

Foundry Sands	Plumbago Foundry Facings	Foundry Supplies
Albany	Our facings are made of carefully selected graphite and are produced in our own mills at Spring City, Pa. Qualities for all classes of work.	Shovels
North River		Sieves
Lumberton		Brushes
Tallytown		Rammers
Catawissa		Bellows
Strong Silica		Buckets
Sharp Silica		Swabs
Fire Sand		Chaplets
Fire Clay	Also:	Coke Forks
Blast Sand	Parting	Coke Baskets
Millville Gravel	Soapstone	Hay Rope
	Blacking	Floor Rammers
	Core Compound	Etc.

HIFRACTO FURNACE CEMENT is making good in many places. Our booklet describes this wonderful product. A copy will be sent on request.

GEORGE F. PETTINOS
1206 LOCUST ST., PHILADELPHIA, PA.

TRIPOLI

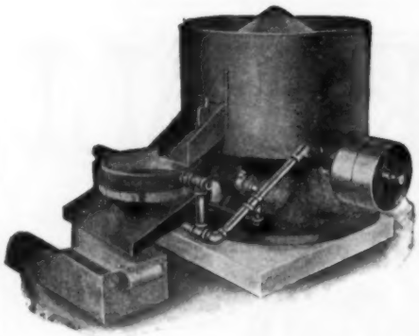
REG. U. S. PAT. OFF

Ask this Question about Tripoli Parting

WHEN parting is offered you, ask the salesman if it contains "Seneca Standard" American Tripoli. That's your guide to quality parting. For more than fifteen years the "Seneca Standard" Tripoli has been selected by leading manufacturers in the industry. They feature parting made with American Tripoli Company's Tripoli—ask for it.

AMERICAN TRIPOLI COMPANY
Subsidiary of Barnsdall Corporation
SENECA, MISSOURI, U. S. A.

Cable Address: "Tripoli, Seneca"
Codes: A B C 5th & 6th; Marconi; Bedford-McNeil



The Wadsworth Compounding Mill

3 FT. SAND MIXING AND COMPOUNDING MILL

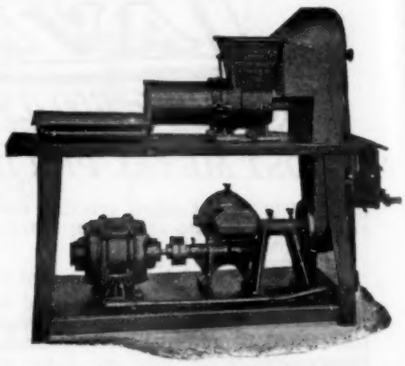
Get full benefits of all compounds and binders by using this mill in mixing your core sands, 5 or 6 tons per day.

Write for our catalogue

CORE ROOM EQUIPMENT

Core Making Machines for round stock bushing cores, absolutely accurate, any size, from 3/8" to 7" in 64ths if needed.

Wadsworth Core Cutting-off and Coning Machine



The Wadsworth Navy Type, Motor Driven, Core Making Machine, 5/8 to 7 in.

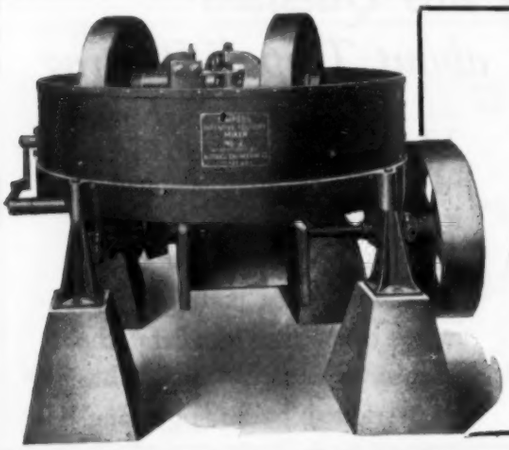
CORE CUTTING OFF AND CONING MACHINE

For cutting cores to length after they are baked and tapering or coning either or both ends for the core print.

Manufacturers of steel bottom and core plate.

THE WADSWORTH CORE MACHINE & EQUIPMENT CO.

AKRON OHIO



SIMPSON SAND MIXER

MADE IN FOUR SIZES

THE SIMPSON INTENSIVE SAND MIXER is a producer of perfect sands at the lowest cost. Perfectly blends new and old sand in facings, and properly distributes binder in core sands, due to adjustable mulling action combined with plows. Suitable for all classes of foundries. Write for circular and prices.

Buy a Simpson. It will pay for itself.

National Engineering Company

549 W. Washington Blvd. Chicago, Ill.

For Better Finished Castings

Use

NEW HAVEN

SANDBLAST

EQUIPMENT

AGENTS FOR DIAMOND GRIT

New Haven Sandblast Company

New Haven, Conn.

99.9% PURE MAGNESIUM

Sticks Cubes Powder Ribbons Wire Turnings

Erftwerk Min. 99.7% C. D.

ALUMINUM CADMIUM

AMALGAMATED METALS SELLING CO., LTD.

42 BROADWAY NEW YORK CITY

Mg 99% Pure Metallic Magnesium

THE NORTON LABORATORIES

41st St. and Madison Ave., N. Y., Lockport, N. Y., Nashua, N. H.
British Thermit Co., Ltd., 49 and 51 The Albany, Liverpool, England
Authorized Representative in British Isles

PAXSON PRODUCTS

MANUFACTURERS AND PRODUCERS

EQUIPMENT

BRASS FURNACES
CORE OVENS
SPRUE CUTTERS
MOLDERS' TUBS
TUMBLING BARRELS
SAND BLAST
DUST COLLECTORS
MAGNETIC SEPARATORS
CORE MACHINES
DRYING STOVES
BAND SAWS
ASHES GRINDERS

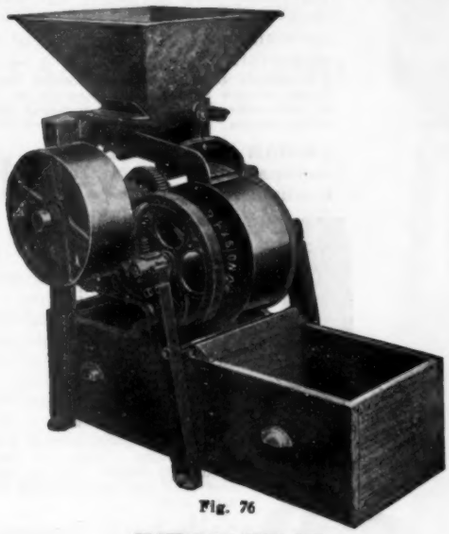


Fig. 76

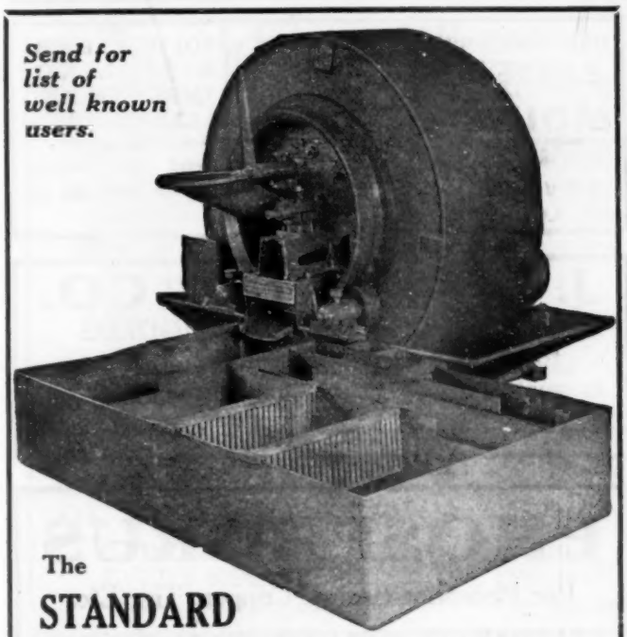
SUPPLIES

TONGS AND SHANKS
FLASKS AND CLAMPS
SPILL TROUGHS
INGOT MOLDS
RIDDLES, BELLOWS
SHOVELS, BRUSHES
MOLDING SANDS
CORE SANDS
PAXSON'S PARTING
FACINGS, CHARCOAL
CORE COMPOUND
ROSIN, OIL, FLOUR

WE MAKE IT
PAXSON MAGNETIC SEPARATOR

J. W. PAXSON CO., Philadelphia, Pa., PROVIDENCE, R. I.
BALTIMORE, MD.

Send for list of well known users.

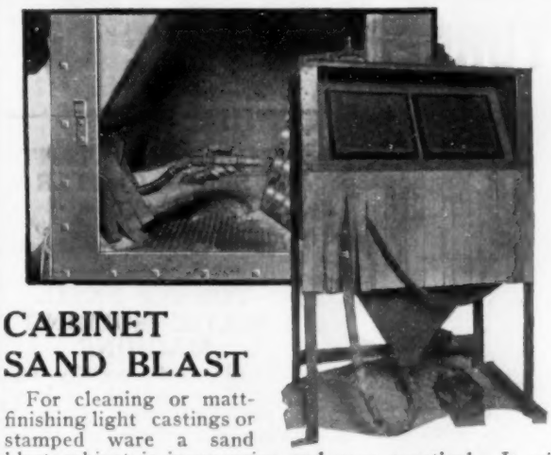


The
STANDARD
Cinder Crushing Mill

It reclaims all metal in cinders, slag, skimmings, old crucibles, etc. Made in four sizes.

Will crush and pulverize 600 to 6,000 lbs. material *per hour* requiring 2½ to 7½ H.P. using same water over and over.

The Standard Equipment Company
NEW HAVEN, CONN.
Manufacturers of Special Foundry Equipment



CABINET SAND BLAST

For cleaning or matt-finishing light castings or stamped ware a sand blast cabinet is inexpensive and very practical. It will also pay for itself on fragile work and special jobs in connection with larger sand blast installations.

It offers the operator clear vision and protection from dust and sand the same as our larger installations.

Work is admitted through a door at either end of the cabinet, and lighted by two large protected electric lights built into the ceiling.

Write for prices and recommendation concerning your class of work to:

The American Foundry Equipment Co.
500 Marlin-Rockwell Bldg., New York, N. Y.

AMERICAN EQUIPMENT
SAND BLAST

You Can Quicken Your Plating and Have a Better Finish

You can produce a mat finish or satin effect—you can heavily frost or place a design or lettering on your goods.

Clean castings of every kind instead of acid pickling—remove scale from metal—remove corrosion or rust from laboratory utensils—hundreds of uses will suggest themselves. Continuous feed of sand—a pailful lasts for many days. Can't get out of order, and no experience whatever needed to operate it.

You simply hold each article under the nozzle and the sand flows like water out of a faucet always under instant control by foot pressure—we have an outfit for every class of work—chandelier, electric fittings, carburetors, bottles, silverware, jewelry, hardware, toilet articles, powder boxes.

LEIMAN BROS. Automatic Continuous Feed

SAND BLAST

With the New Foot Feed Control

A few things for sand blasting: Phonograph parts, Aluminum Powder Boxes, Jewelry, Building Hardware, Automobile Fixtures, Telephone parts, Bottles, Glasses, Trunk Hardware, Metal Castings, Clock parts, Bronzes, Camera parts, Hair Ornaments, Gears, Dies, Tools, Watch Cases, Skates, Badges, Buttons, Pyrometers, Electric Light Bulbs. Write us about the goods you make. We can show you how they can be improved with the sand blast.

A few users: Baker Cocoanut Co., Gas Engineering Co., Boston Pencil Pointer Co., Russell & Stoll Co., Seth Thomas Clock Co., Claybourne Process Co., Franklin Die Casting Co., Winchester Repeating Arms Co., Lawrence Aero Engine Co., Bastian Bros. Co., Newark Gear Cutting Machine Co., Standard Button Machine Co., Otis Elevator Co., National Casket Co., Kensington Machine Works, Millersburg Reamer and Tool Co., S. K. Baker & Co., Wagner Glass Works, A. G. Spalding & Bro., Illinois Watch Case Co., Amesworth Mfg. Co., D. L. Auld Co., Westinghouse Lamp Co., Peck, Stow & Wilcox Co., Eastman Kodak Co., Bristol Co., Caldwell & Co., Corning Glass Co.

Agitation in Solution Tanks—Heating with Fuel Oil—Heating Gas Appliances, Blowpipes, etc.

LEIMAN BROS. **AIR PUMPS** NOISELESS WEARPROOF

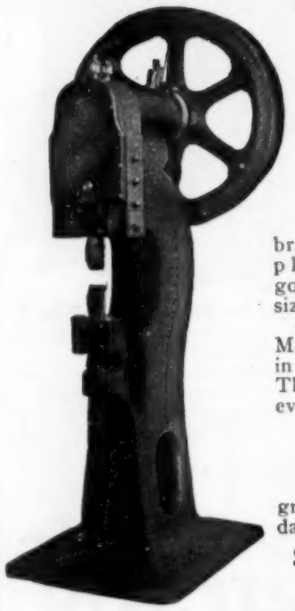
LEIMAN BROS. 60 Lispenard St. New York

Makers of Good Machinery for 35 Years

TURNER MACHINE CO.

3633 North Lawrence Street

PHILADELPHIA, PA.



TURNER PATENT SPRUE CUTTER
WITH BELT DRIVE

Strong, rigid, durable; large capacity, good adjustment, good frame.

TURNER PNEUMATIC MOLDING MACHINE

Designed specially for brass foundries making plumbers' and electrical goods, etc. Built in three sizes.

Our Hand Power Molding Machines are highly regarded in numerous large foundries. This new pneumatic type is even better.

AUTOMATIC COCK GRINDER

With one operator will grind 400 ¾-inch cocks per day.

SAND SIFTER AND MIXER

Made with single or double heads. Requires only ½ horsepower. Soon pays for itself.

Send for Catalog M2

USE ONLY THE CHAS. K. SCHWEIZER CO.

MOULDS

Waterback and Plain

207 Vine Street, ST. LOUIS, MO.

SOLDER, BABBITT, LINOTYPE, TIN AND LEAD MOULDS.

Send your inquiries on special designs.

J. P. FANNING CO.

Makers of **SOFT METAL MOULDS** for casting lead, solder, babbitt metal, buck shot, car seals, etc.

678 Jefferson Ave. Brooklyn, N. Y.

W. J. Whitley, Mgr.

PHOSPHORUS

For Phosphor-Bronze Copper, Tin, Etc.

GENERAL CHEMICAL CO. 1421 Chestnut Street PHILADELPHIA, PA.

DIE CASTING MACHINES, $200.00

—hand operated,—soft alloys.

For hollow (SLUSH) or solid and cored castings, dies water cooled or not as desired.

If you pour castings in metal moulds, write and send sample to

R. E. BYRD, 318 REED ST., ERIE, PA., MFR.

FOR SALE—Patent 1466294 Automatic D-C Machine

HERE IS THAT GATE

This galvanized sheet metal cut-off gate in three sizes, 4 in., 5 in., and 6 in., offers to

BLOWPIPE MANUFACTURERS AND DEALERS

a complete solution of a big problem.

ITS COST IS LESS THAN ONE-HALF

that of cast-iron gates and it is practically unbreakable. For controlling or cutting off air or light material going through dust-collecting and exhaust systems, it will be found most practical and durable and at very low cost.

Write for dealer's prices and discounts.

Grand Rapids Blow Pipe and Dust Arrester Co.

Dust Collecting Systems — Grand Rapids, Michigan

Economy ADJUSTABLE HOODS

Operate with much less suction—more quickly adjusted and never in way of operator—

SAVE POWER and TIME

State height of spindle from floor and size of largest wheel used. We'll send one "on trial." If not satisfactory—return at our expense.

We design and install Complete Dust Collecting Systems—can rid your polishing and buffing department of dust. Send for our catalog.

THE KIRK & BLUM MFG. CO.
Pneumatic Engineers
High Grade Dust Collecting Systems
2846 Spring Grove Ave., Cincinnati, O.

SAND-BLASTS
DUST ARRESTERS
TYPE AND SIZE FOR EVERY REQUIREMENT
World's Largest Manufacturers

DANGBORN CORPORATION — ALL WAYS SERVICE — ALWAYS — HAGERSTOWN, MD.

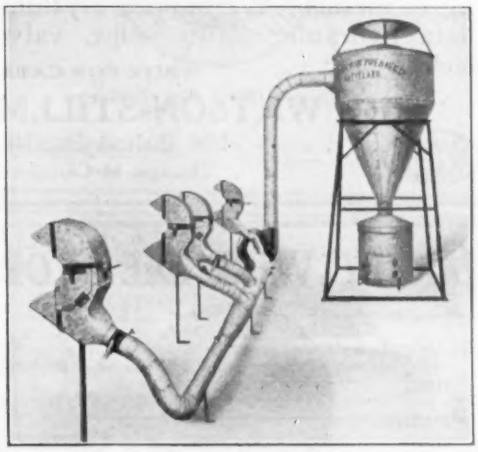
P. O. Box 854

For Faultless Castings

Extract all iron from other material with a High Duty Magnetic Separator. Insure *pure* brass, bronze or aluminum. Iron foundries reclaim wasted iron from scrap heap. High Dutys have paid for themselves in three months in scores of foundries. Write for *free* booklet on magnetic separation and proof that a High Duty installation will pay you.

MAGNETIC MANUFACTURING CO. 290-23rd Ave., Milwaukee, Wis.

CLEVELAND Blow Pipe EFFICIENCY



Dust Collecting Systems for:
Buffing, Polishing, Emery Wheels and Swing Frame Grinders.

Cleveland Blow Pipe & Mfg. Co.
6950 Kinsman Rd., Cleveland, O.

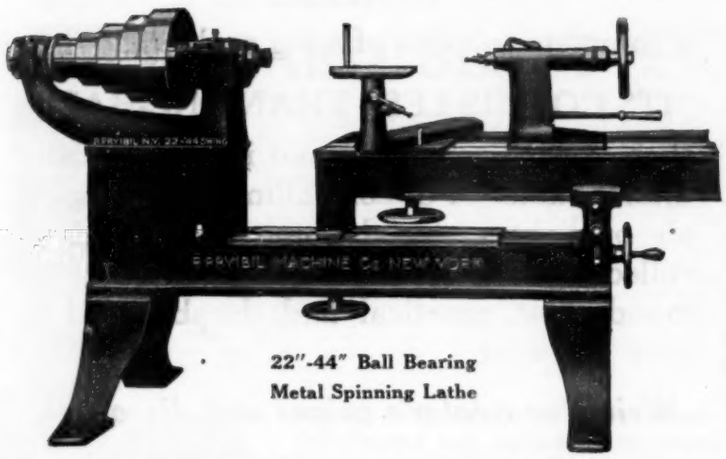
Established 1859

PRYIBIL

METAL SPINNING LATHES

and Accessories

For Round
and
Oval Work
From 15″-60″ Swing



22″-44″ Ball Bearing
Metal Spinning Lathe

P. PRYIBIL MACHINE CO., 534-536 West 58th St. NEW YORK CITY

HYDRAULIC PRESSES

FOR

DIE SINKING, PRESSING, EMBOSSING, SHEET METAL FORMING, DRAWING, CUPPING, FLANGING, BENDING AND EXTRUDING

Our line of presses contains many machines built for the working of metals. We build everything necessary to equip complete hydraulic plants—pipe, valves, pumps, accumulators, packing, etc.

WRITE FOR CATALOGS

THE WATSON-STILLMAN COMPANY
196 Fulton St., New York
Chicago, McCormick Building

VIANNEY WIRE DIE WORKS

6 Guarantees and Prompt Deliveries

3 Factories Write for Quotations

The world's largest manufacturers of Wire Drawing Diamond Dies

V. J. BOULIN, *Mgr.*
NEW YORK OFFICE : 100 FIFTH AVENUE

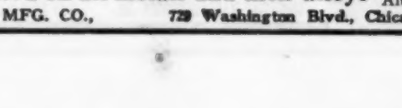
SUPERIOR SOLDERING FLUX

Your best insurance against leaks in soldering brass goods of all kinds

Superior Chemical & Mfg. Co.
ASPINWALL, PA.

IF YOU HAVE DIFFICULT SOLDERING
"IT CAN BE DONE"
with

END YOUR SOLDERING TROUBLES



SAMPLE FREE

Can be used on all metals and their alloys Except Aluminum

JOHNSON MFG. CO., 729 Washington Blvd., Chicago, Ill.

WIRE DRAWING GREASES

We manufacture a draw grease to be dissolved in water, in all qualities for wet or dry drawing. Also an extra special grease for dry drawing for nickel, silver, chrome nickel, and hardened steel wire.

Our twenty-five years' experience in the wire drawing business enables us to put a first class grease on the market which every manufacturer in the wire business, as well as the workingman (wire-drawer), will be glad to use.

The use of our greases results in—

LESS WEAR of the dies on all wire drawing machines, especially diamond.
PRODUCTION INCREASED due to the simple process of dissolving the grease in water.
LESS TIME CONSUMED, as dissolving of the grease requires but a few minutes, and a separation between grease and water is impossible.
A ROUND SMOOTH FINISH is obtained on the wire, devoid of all irregularities, even though the wire may have been damaged by previous operations.

Send for Quotations. Specify whether for wet or dry drawing, and quality.

Patent Applied For.

The United States Wire Draw Grease Co.

34 Port Street : - : ELIZABETH, N. J.

Wanted: Salesmen on commission all over the United States.

"PECK"

Automatic Drop Lifters

will convert those hand or foot drops and unsatisfactory automatics into

Productive Automatic Drops

Capacity 15 to 5,000 pounds

DROP PRESSES FOR ALL PURPOSES

MINER & PECK MFG. CO.
DERBY, CONN.

BUILDERS OF OVENS FOR 34 YEARS

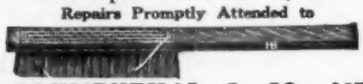
STEINER OVENS FOR BEST RESULTS

Send for Catalog M

E. E. STEINER & CO., Inc. 2-16 Avenue C Cor. Parkhurst St. **Newark, N. J.**

BRUSHES

Brass, Copper and Steel Wire Brushes
An assortment of
Machine and Circular Brushes
Chandelier Manufacturers', Silver and Nickelplaters' Brushes, etc.
Repairs Promptly Attended to



H. BLUMENTHAL & CO., MFRS.
ANDREW H. LAU, Sole Proprietor
241-243-245 CENTRE ST., NEW YORK
Ask for Catalog "M"

BALL BEARING METAL SPINNING LATHES

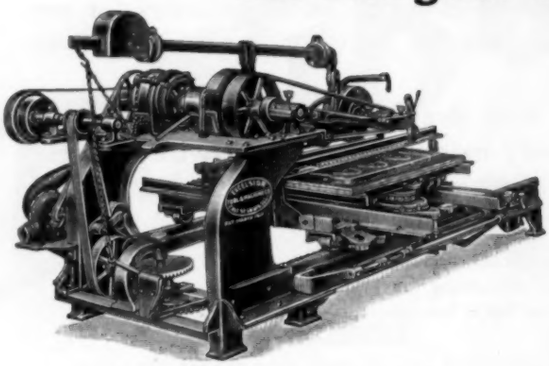
SIZES
15"-18"-22"-26"
Formerly with Pryibil

OVAL CHUCKS
Ball Bearing Back Centers and Supplies

MANUFACTURED by
Thomas Fruin Machine Co.
503—5th Avenue
New York City

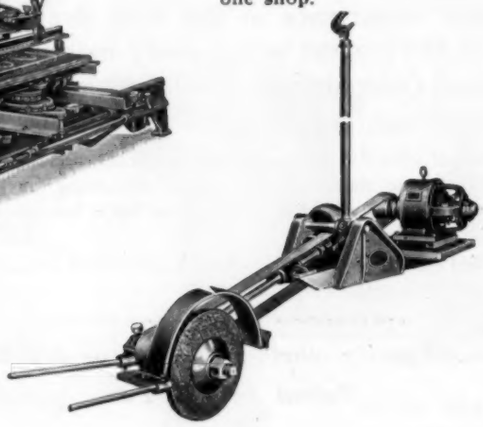
Factory
Brooklyn, N. Y.

Three Modern Production Machines Installed in the Largest Up-to-Date Plants



No. 27 Automatic Surface Grinding and Polishing Machine. Sixteen in use in one shop. Used in England, France, Belgium, Canada and the U. S.

No. 8 Swing Grinder, made in 3 styles and 4 sizes. Nine in one shop.



No. 25 Double Spindle Polishing and Buffing Lathe, Ball Bearing. Forty-five in use in one shop. No loose pulleys, belt tighteners or countershafts. Polishing room always free from dust.

Send for our literature and prices.

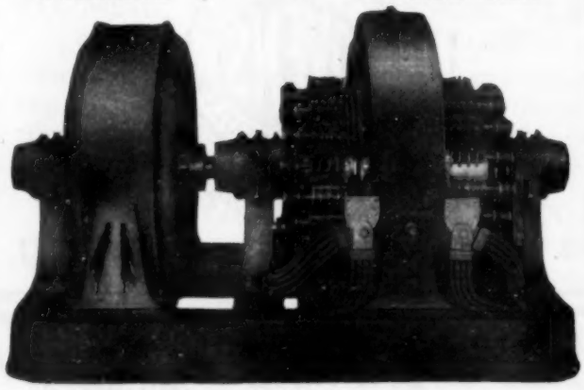
We can convince you our machines are real production machines that will eliminate trouble.

Excelsior Tool and Machine Company

31st STREET and RIDGE AVE. **EAST ST. LOUIS, ILL.**

The Eager Electric Company

Watertown **New York**



6,000 Ampere, 6 Volt Motor-Generator

SERVICE-SAVING

Do not spend money for a plating generator larger than you will ever need. Take advantage of our expert knowledge, based upon many years of technical and practical experience, to assist you in determining scientifically just what your requirements are.

Then let us quote you prices on a generator or motor-generator set which is guaranteed to deliver continuously full rated capacity.

We have added to our engineering department a division of plating experts.

This division is at your service and prepared at all times to give expert advice and assistance on all matters pertaining to your plating problems.

When desired we will send a competent man to plan and superintend the installation of your plating plant.

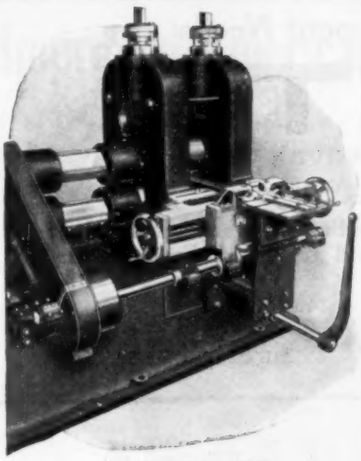
Books on Plating
Books on Metals
Books on Machinery

Articles on all Related Subjects

Write for full Information

THE METAL INDUSTRY

99 JOHN ST., NEW YORK



10" Edging Mill

Rolling Mills
Flat Wire Mills
Edging Mills
Tandem Mills

Flatteners
Straighteners
Slitters

Coilers
Blockers
Reels
Winders

Drying Machines
Cleaning Machines
Pickling Machines
Scouring Machines

Scratch Brushing Machines, Etc.

COLD ROLLING AND FINISHING MACHINERY

For sheets and strips—brass, copper, steel, zinc, nickel silver, sterling, gold, platinum, aluminum, resistance metals, duralumin, etc.

THE BLAKE & JOHNSON CO.
ESTABLISHED 1849
WATERBURY, CONN., U. S. A.

The Babcock & Wilcox Co.

85 LIBERTY STREET, NEW YORK

ESTABLISHED 1868

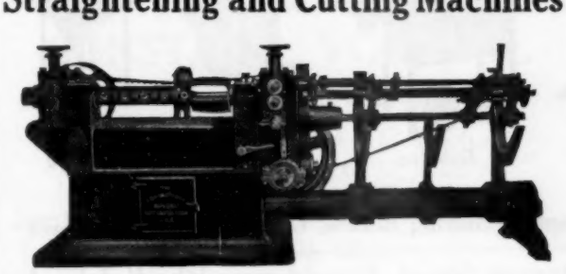
THE BABCOCK & WILCOX COMPANY — STEAM

Water Tube Boilers
Steam Superheaters
Chain Gate Stokers

BRANCHES

BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
DETROIT, Ford Building
CINCINNATI, Traction Building
ATLANTA, Candler Building
PHOENIX, ARIZ., Heard Building
NEW ORLEANS, 521-5 Baronne Street
HOUSTON, TEXAS, Southern Pacific Building
DALLAS, TEXAS, 2001 Magnolia Building
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-406 Central Building
PORTLAND, OREGON, 805 Gasco Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
SAN JUAN, PORTO RICO, Royal Bank Building
HONOLULU, H. T., Castle & Cooke Building

Shuster Automatic Wire Straightening and Cutting Machines



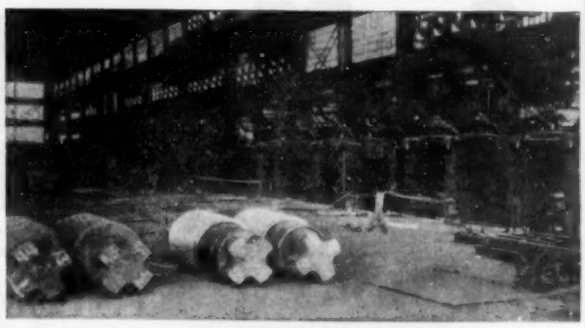
28,000 pieces of drill rod cut to 6" lengths per hour is the report from one user, and in the same plant a larger machine turns out 20,000 pounds of ¼" diameter stock per day.

Cost of operation is small, lengths are absolutely accurate, wire perfectly straight.

They will do as much for you.

May we send Catalogue M?

THE F. B. SHUSTER CO.
NEW HAVEN, CONN.
formerly John Adt & Son
ESTABLISHED 1866



Practically a CENTURY AND A QUARTER of Rolling Mill Experience—building Mills for the Copper, Brass and non-ferrous industries, and making the Mill Rolls—A WORLD'S RECORD.

With every pound of material, and every hour of workmanship which go into MACKINTOSH-HEMPHILL COMPANY'S PRODUCTS, there goes that invisible SOMETHING representing the skill, experience and art of the MASTER BUILDER.

We were first to build, staunch, reliable rolling mills, and we will always build only as the MASTER BUILDER should—with the object of furnishing

"EACH MILL A BETTER MILL"

THE BEST IN MATERIAL · THE BEST IN WORKMANSHIP
THE BEST IN DESIGN · THE BEST IN EXPERIENCE
THE BEST FOR OUR CUSTOMERS

MACKINTOSH-HEMPHILL COMPANY

Established 1803 at
PITTSBURGH, PENNA.
U. S. A.

"The Best in Rolling Mill Machinery"

Fort Pitt Foundry
A. Garrison Foundry
Woodard Machine Co.
Pittsburgh Iron & Steel F'dry.

LIONITE
KING OF ABRASIVES
NIAGARA FALLS, N.Y.
GENERAL ABRASIVE CO.
Trade Mark

Our Booklet on MODERN POLISHING will interest you.

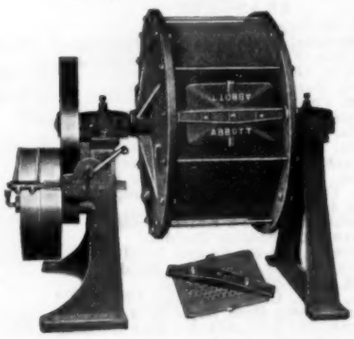
Your Polishing Department Needs

LIONITE

THE ELECTRIC ABRASIVE

A well known Computing Scale Co. writes:—
"We recently received 10 lbs. No. 46 Lionite and have given same a thorough test. We are well pleased with the results and are enclosing herewith our order for 2 barrels of this material."
(Name on application)

GENERAL ABRASIVE CO. **Niagara Falls, N. Y.**



ABBOTT BURNISHING BARRELS and BALLS

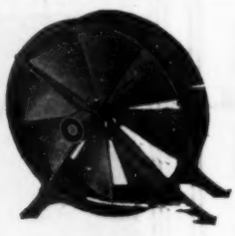
produce
Better Work Larger Production Lower Costs
Adapted to Practically All Kinds of Small Metal Parts, Both Before and After Plating
The Border Is Symbolical Of What We Manufacture
STEEL BALLS—BURNISHING CONES—BURNISHING OATS
Demonstrations Conducted Shipments from Stock

THE ABBOTT BALL COMPANY

Originators of Commercial Ball Burnishing
Abbott Street Elmwood District HARTFORD, CONN.

Blower

Polishing Bench


Ventilator

Rubbing

Drying

Sand Blast

THE BOLAND SYSTEMS

FOR FACTORY INSTALLATIONS
Tanks, Coloring Rooms, Dynamos, Sawdust Boxes

H. J. ASTLE & CO. (Send for Catalogues) 118 Orange Street, Providence, Rhode Island

Borolon
TRADE MARK

POLISHING GRAIN

Borolon Polishing Grain (Electric Corundum) is the product of our own electric furnaces. As Manufacturers we control uniformity of grain which assures satisfaction to the user. All regular grain numbers supplied in eight different sized containers. Write for samples and prices of the numbers you regularly use.

ABRASIVE COMPANY

Main Office and Factory
BRIDESBURG
PHILADELPHIA, PA.

ABRASIVE
REGISTERED

Branch Office
566 W. Washington Blvd.
CHICAGO, ILL.

TRI-B BRAND

REASONS WHY SULPHURETTE

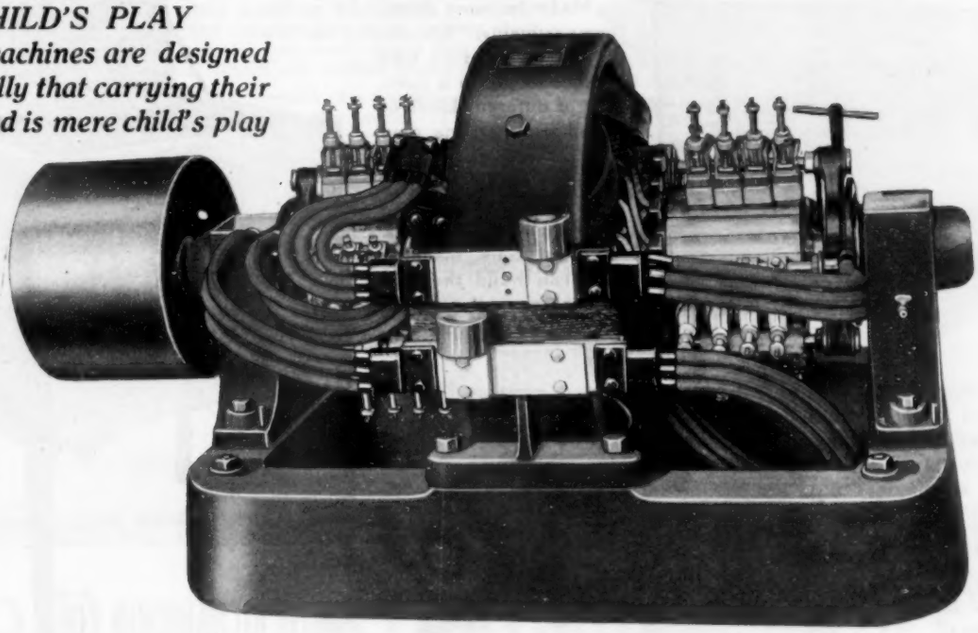
is the best for all OXIDIZING Purposes.
1..Contains highest amount of combined sulphur.
2..Produces more durable, lasting finish.
3..Yields 100% satisfaction.
4..Recommended by large users.
You are protected by the Blue Shield of Satisfaction. Ask for prices on LUMP, POWDER or LIQUID SULPHURETTE.

ASK YOUR JOBBER OR THE
C.G. BUCHANAN CHEMICAL CO.
CINCINNATI • • OHIO.

Improved American Giant Dynamo and Motor Generator Sets

CHILD'S PLAY

These machines are designed so liberally that carrying their rated load is mere child's play



Connecticut Dynamo & Motor Company, 190 Lyons Avenue Irvington, New Jersey

Electro-Plating Generators

From 175 to 8,000 ampere capacity

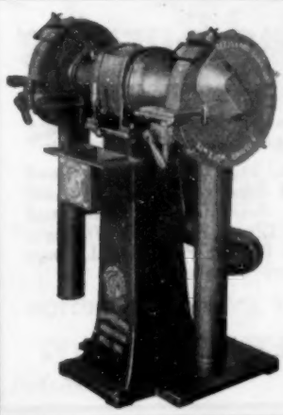
Maintaining

CONSTANT VOLTAGE

with all changes of load.

Voltage adjustable from 2 to 8 volts—larger sizes from 4 to 12 volts.

Jantz & Leist Electric Company
Cincinnati, Ohio



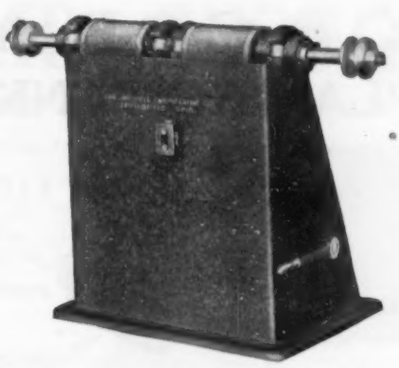
C. A. W. GRINDERS BUFFERS AND POLISHERS

Equipped with Timken Tapered Adjustable Roller Bearings. The Product of 28 years' experience. All sizes and types. Made in the heart of the Brass Industry, especially for Brass Founders and Finishers.

LIBERAL LONG TERM PAYMENT PLAN

AGENTS WANTED

CLEVELAND ARMATURE WORKS Inc.
4732 St. Clair Ave. Cleveland, Ohio



MOTOR DRIVEN POLISHING LATHES

A complete motor driven unit with which it is possible to obtain any desired spindle or wheel speed, regardless of the motor speed. This machine has the further advantage of starting or stopping either end independently of the other. Catalog?

The Mitchell Engineering Co.
SPRINGFIELD, OHIO

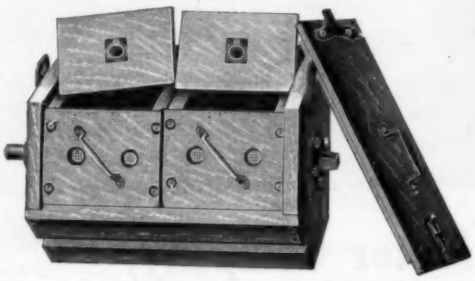
Imperial Patented Multiple Compartment Machines

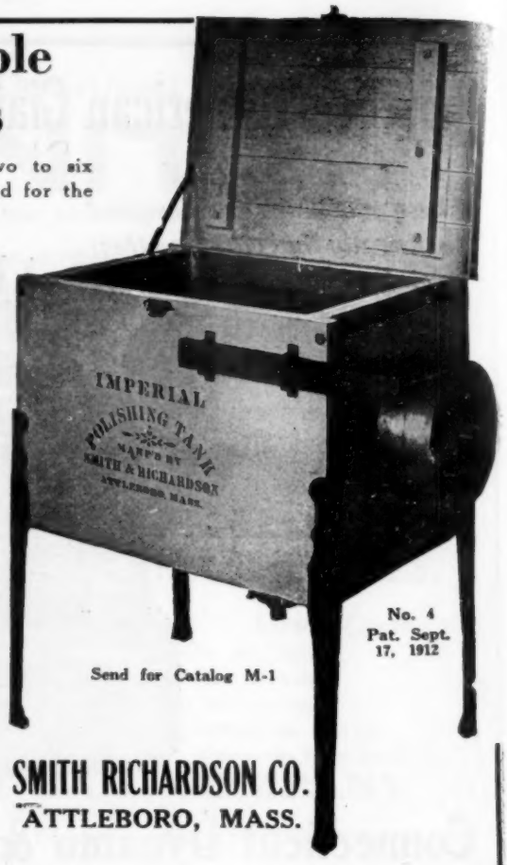
No. 12
Pat. Sept. 17, 1912

Made in sizes from two to six compartments. Unequalled for the manufacturer who wishes to polish a number of different kinds of small parts at one time and keep each kind separate.

We make seven stock sizes of this machine and can build them in special sizes if wanted.

We also build several sizes of single compartment machines and carry a complete stock of steel balls, cones, spickets and soap powder for burnishing purposes. We solicit articles for free demonstration.





No. 4
Pat. Sept.
17, 1912

Send for Catalog M-1

SMITH RICHARDSON CO.
ATTLEBORO, MASS.

ESTABLISHED 1865

CORCORAN
PLATING TANKS

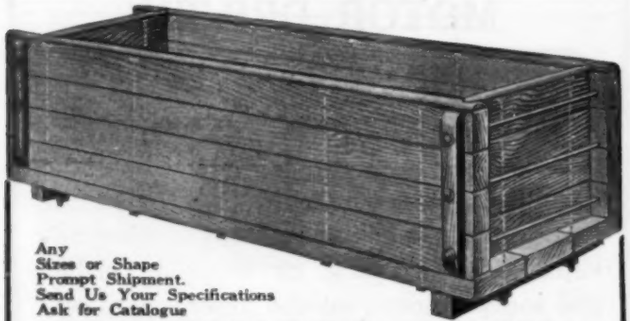
A. J. CORCORAN, Inc.
749 Jersey Avenue
JERSEY CITY, N. J.

ATLANTIC TANK & BARREL CORP'N

ESTABLISHED 1853

Tanks Any Size or Shape, for Any Purpose
Plain or Lined

15th & Jefferson St. Hoboken, N. J.



Any
Sizes or Shape
Prompt Shipment.
Send Us Your Specifications
Ask for Catalogue

KALAMAZOO TANKS
KALAMAZOO TANK & SILO CO.
Kalamazoo Michigan

Chemical Lead Burning
Lead Chemical Equipment

LEAD LINED TANKS

Lead Linings for Tanks, Vats, etc.; Lead Coils; Lead Sleeves; Agitators; Lead, Acid Jugs and Carboys; Acid Chambers and Towers; Lead, Acid Supply, Drain and Waste Lines; Lead and Lead Lined Pipe and Fittings; Special Lead Traps and Drain Boxes; Pure Tin Linings for Vessels of Every Character

CHEMICAL LEAD WORK OF EVERY DESCRIPTION

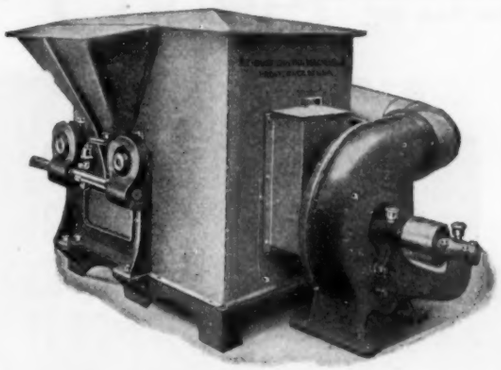
JOHN F. ABERNETHY
708-710 Myrtle Ave., BROOKLYN, N. Y.

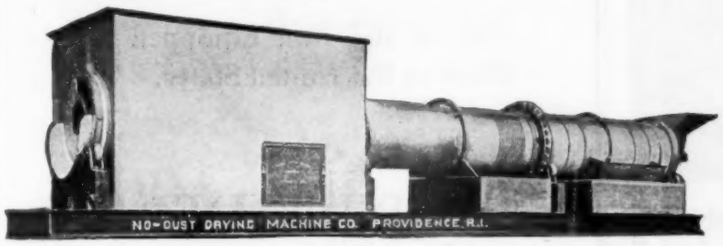
DO YOU WANT UNIFORM CLEANSING?

Our combination cleansing and drying apparatus gives it. The work is slowly agitated while washing; the time is positively fixed and no one article is in the solution longer or shorter than any other. No commercial method can wash more thoroughly or cheaper than this apparatus. Shells are washed inside and out.

Solutions are contained in tanks beneath the machine and are picked up by scoops and poured onto the work. The work passes from one operation to the next automatically; no handling except to fill hopper and take away filled receptacles. One man can operate and do same amount of work as six or eight by dipping.

All this apparatus is built to your specifications as to number of solutions and production; we can give you what you want. When you write, give us the operations you desire, length of time in solution and production required.





We offer a line of dryers for metal parts that will meet all requirements. Work that cannot be dried in a centrifugal or sawdust can be thoroughly dried in one of our various types. Dryers for jewelry and base metals. Give us an idea of your work and quantity so we can recommend the best type for it.

NO-DUST DRYING MACHINE CO.

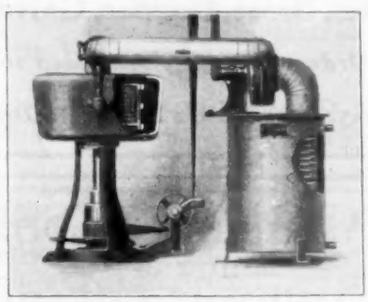
Globe and Hospital Sts. **Providence, R. I., U. S. A.**

In 1 to 7 Minutes

Quantity drying of small metal parts—bright finish—no tarnish or oxidation

TOLHURST

REG. U. S. PATENT OFF.



Centrifugal Metal Dryer

Basket Diameter	Capacity	Type of Basket
12 inches	.14 bushels	Removable
16 "	.18 "	"
20 "	.47 "	"
26 "	1.3 "	Bottom Discharge
32 "	2.8 "	" "
40 "	5.4 "	" "

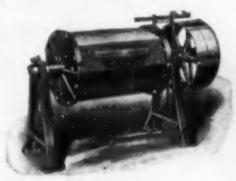
TOLHURST MACHINE WORKS

Established 1852 **TROY, N. Y.**

FAIR ENOUGH

The best way to determine which barrel is the best for your job is by trying it out yourself. Write us without delay asking about our trial offer so that you can run our barrels in your own shop on trial.

Below is one of our Tilting Machines with the popular Henderson Maple Barrel.



The Japan barrel shown below follows out the Henderson simplicity in construction.

The above barrel is coming to be the most popular Horizontal Barrel on the market. Write us and find out why.

THE HENDERSON BROS. CO.

A Tumbling Barrel for Every Purpose

135 So. Leonard St. **Waterbury, Conn.**

JOB PLATING

Largest Facilities in New York City

Established 1889

PLATING, POLISHING, DIPPING, LACQUERING, BARREL PLATING AND TUMBLING

Manufacturers' and Contract Work Our Specialty

PHILIP SIEVERING, Inc.

197 LAFAYETTE STREET NEW YORK

Telephone: Canal { 5336 / 7825

Electro-Plating Electro Galvanizing Polishing and Buffing

Contract work solicited

Service and Quality Guaranteed

Largest and Best Equipped Job Plant in the United States.

A. A. BRUNELL CO., Inc.

Office: 15 Vine St.

Factory: 475 Shrewsbury St.

WORCESTER MASS.

WHY IS IT

wherever GLOBE Tumbling Equipment is once installed, it is re-ordered when additional tumbling equipment is needed?

It must be that GLOBE Tumbling Barrels do their work mighty well in finishing and cleaning metal parts. Years of hard work and continuous service with low upkeep costs are characteristic of GLOBE Tumbling Barrels.

The Globe Machine & Stamping Co.

CLEVELAND, OHIO

Boston Tumble Barrel Plating Works

Specialty of Tumbling Barrel Plating in Nickel, Brass, Copper, Galvanizing

Orders Promptly Attended to

12A Thayer St., Reed's Block, Boston, Mass.

TANKS and VESSELS

MADE OF

ACID-PROOF CHEMICAL STONEWARE

resist the deteriorating action of all commercial acids and corrosive compounds.

Write Dept. B for full particulars.

GENERAL CERAMICS CO.

50 Church St. New York City

JOHN C. WIARDA & CO.

Howard B. Bishop, President.

—EST. 1871—

MANUFACTURING CHEMISTS

269 GREENE ST. BROOKLYN, N. Y.

BONE ASH

Hydrofluoric Acid
Copper Carbonate
Nickel Salts

SODA ASH

Caustic Soda
Tri Soda Phosphate
Caustic Potash-
Soda Chlorate

Cooper's

Plate for Permanency

Chemicals

are diverse and complete

Cleanser
Acids
Salts
Oxidizers
Lacquers

Use

Plate for Permanency Chemicals throughout

Chas. Cooper & Co.

194 Worth Street New York

Manufacturers Since 1857

WORKS: NEWARK, N. J.

A FULL LINE OF

PLATING and POLISHING MACHINERY and EQUIPMENT

ANODES
BARRELS (TUMBLING)
BRUSHES
BUFFS
CHEMICALS
CROCUS
CRUCIBLES
CROCKS
DIPPING BASKETS
DYNAMOS
EMERY
FELT WHEELS
FOUNDRY SUPPLIES
GENERATOR SETS
GRINDING LATHES
LIME FINISH
NICKEL SALTS
OVENS
POLISHING LATHES
PUMICE
RHEOSTATS
ROUGES
SAND BLAST CABINETS
TANKS—ALL KINDS
TRIPOLI COMPOSITIONS
WASTE

Write for Catalog

GEORGE W. KYLE & CO., INC.
GRAND AND THOMPSON STREETS
NEW YORK

FELT

SMOOTH, MIRROR-LIKE SURFACES

The brilliant polish—the lustrous finish—that helps so greatly to sell the article, is a result that every polishing room strives for. You can depend upon the polishing felts made by the American Felt Company to give smooth, mirror-like surfaces.

They are used in shops that produce the highest grade work.

We shall be very glad indeed to suggest the right felt for your purpose. Sending us your specifications does not place you under any obligation.

American Felt Company

TRADE MARK

211 Congress St. BOSTON
114 E. 13th St. NEW YORK
325 So. Market St. CHICAGO

WHEELS — BUFFING AND POLISHING
Correctly Constructed—Properly Priced, Definite Delivery

Makers of
FINE BUFFS AND COMPOSITIONS
Since 1888

E. Reed Burns Mfg. Corp.

21-27 Jackson St., 40-42 Withers St., Brooklyn, N. Y.

E. REED BURNS & SONS, INC.
1811-15 Carroll Ave., Chicago, Ill. 1037 E. 62nd Street, Cleveland, Ohio

"Our Customers' Viewpoint Molds Our Policies"

Equipment — Supplies — Chemicals

Everything for the

Plater and Polisher

VAYCO

The Trademark of The John J. Vay Co. identifies Platers & Polishers' Equipment & Supplies of the highest Qualities obtainable.

Prompt Shipments

From our new Cleveland warehouse. We are prepared to give prompt service together with the lowest prices consistent with high grade merchandise.

Our Prices will make you a Permanent Satisfied Customer

The John J. Vay Company

—Electroplaters & Polishers' Equipment & Supplies—

721-731 Frankfort Ave., N. W. Cleveland, Ohio

The Fastest Growing Supply House in the Industry

"X X X WHITE DIAMOND"

To protect our customers after January 1st, 1924, each cake of this composition will have this design moulded in cake.

Manufactured only by

THE MATCHLESS METAL POLISH CO.

840 W. 49th Place, Chicago, Ill. 726 Bloomfield Ave., Glen Ridge, N. J.

NATROLIN

METAL CLEANER

Now Distributed in Buffalo, N. Y., by

NICHOLS-VOGT CHEMICAL CO., 1392 Niagara Street

"Liquid Sulphur"

GREENSBURG, PA.

Will print monthly in this space a formula for its use.

"BRIDGEPORT SAFETY"

Heavy Duty Buffing Lathes, free from Vibration. Produce more at lower costs. Wide heavy bases—large spindles and ball bearings are in their construction.

Belt or Motor Driven. *Catalog?*

The Bridgeport Safety Emery Wheel Co., Inc.

87 Knowlton Street, Bridgeport, Conn.

MR. PLATER

HAVE YOU TRIED DUSTLESS MAPLE SAWDUST?

It has double the drying and plating qualifications of any ordinary hardwood sawdust. Good for polishing and plating brass, bronze, copper, aluminum and metal goods. Samples on request.

NATIONAL SAWDUST CO.

108 NORTH FIRST STREET BROOKLYN, N. Y.

Experience has taught us

that a jobber's ability ends with that of the principle he represents. Hence, we have associated ourselves with such old reliable manufacturers as

ABRASIVE MINING & MFG. CO.	Emery
AMERICAN CYANAMID CO.	Cyanides
DIVINE BROS. CO.	Buffs
MAAS & WALDSTEIN CO.	Lacquers
MATCHLESS METAL POLISH CO.	Compositions

and many others too numerous to mention in such limited space.

By acting as distributors for these manufacturers and by carrying **large stocks in Cincinnati,** we are placed in a position to give you unexcelled service on the highest quality.

Equipment and Supplies for your Plating, Polishing and Grinding

We solicit your inquiries

THE THOS. BUCHANAN CO.

114-116 West Pearl St. **Cincinnati, Ohio**

HF&G

NICKEL ANODES
NICKEL SALTS

Single and Double

PURITY GUARANTEED

H. F. & G. "ECONOMY" ANODE

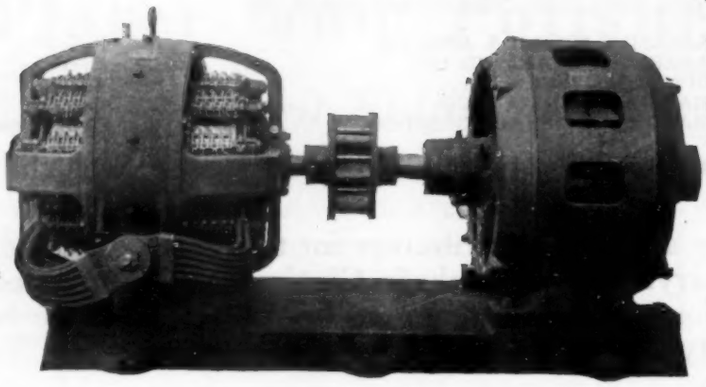
The Harshaw Fuller & Goodwin Co.

Cleveland

Chicago **New York** **Philadelphia**

Mascot Brand

Compositions
Emery Cake
Tripoli
Lime Finish
Coloring Composition
Crocus



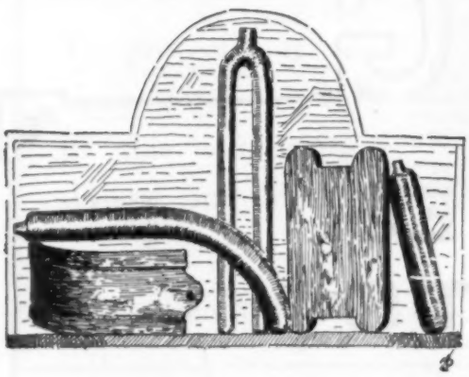
6000 Ampere 6 Volt Motor Generator Set

Bleached Pieced Buffs
Unbleached full disc Buffs
Canvas Wheels
Sheepskin Wheels
Bull-neck Wheels
Rag Wheels

12 other types to meet your specific requirements

Our Practical, Experienced Representatives Go Anywhere

BENNETT-O'CONNELL COMPANY
3600 S. MORGAN ST., CHICAGO, ILL.
AYER-O'CONNELL MFG. COMPANY MERIDEN, CONN.

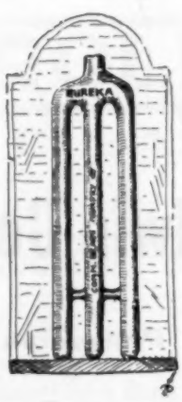


Eureka Tri-Bar Nickel Anodes

This anode provides for greater efficiency by allowing the solution to pass between the bars—leaving a large exposed surface from which to take the metal—naturally giving a quicker action.

No waste—as all three bars deposit the metal equally.

Give it a trial.



Connecticut Anodes—

Nickel - Brass - Copper - Zinc

Any Size—Any Shape

We know, from long experience, how to make good, free-working anodes. You benefit from our special process of manufacture which enables us to quote low prices. Tell us your requirements and get our quotations.

Your inquiries and orders will receive careful attention. Our prices and our service are designed to secure and hold your trade.

Connecticut Brass Foundry Company
664 East Main Street, Waterbury, Conn.

Baird Tumblers For All Purposes

Single Oblique Cast Barrel

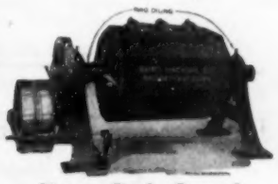
Japanning Barrel

Baird-Warner

Steam Drying Barrel

Ball Burnishing Barrel

Single Horizontal Grinding



Heavy Back Geared Grinding

ALL TYPES OF MACHINES—oblique tilting, horizontal, exhaust, non-exhaust, single, double, four-barrel, steam drying, japanning, ball burnishing.

EVERY TYPE OF BARREL—cast brass, cast iron, sheet brass, sheet iron, sheet copper, wood, cast iron with wood lining, wood barrel with metal lining, wood barrel with metal bottom or any other variation or combination of material. Barrels may be round, octagonal, four or eight sided, long or short, wide or narrow. They may be smooth inside or fitted with fins, or steps, or any one of many arrangements to effect the movement of work inside the barrel. There may be covers, or sieves, or divisions, special methods of heating or cooling or applying water, loading or unloading.

DESCRIPTIONS OF VARIOUS TYPES OF TUMBLERS ARE GIVEN IN BULLETINS 300, 301, 302, 303 AND 309. THEY WILL BE SENT ON REQUEST.

The Baird Machine Company

Bridgeport **Connecticut**

FOREIGN REPRESENTATIVES

R. CRUICKSHANK, LTD.	BIRMINGHAM, ENGLAND
Societe Anonyme des Establissements FENWICK FRERES & CO.	PARIS, FRANCE
FENWICK FRERES, 1 Avenue Blonden	LIEGE, BELGIUM
FRATELLI FENWICK, 6 Via Lagrange	TORINO, ITALY
VICTOR SOUSSAN, 29 Rua de Goncalves Dias	RIO DE JANEIRO, BRAZIL
B. V. CONSTANTINOV "Industry Corp."	MOSCOW AND KRASNOIARSK, RUSSIA
ZAVAS-ABREU COMMERCIAL CO.	HAVANA, CUBA

Christmas 1923

With the approach of Christmas and its spirit of peace and good fellowship it is with the utmost pleasure and sincerity that we join the many friends of the

WYANDOTTE Metal Cleaners

in wishes for success, prosperity and hearty good will.

This year has been exceptional in its opportunities for "honest to goodness" service to humanity.

The realization of this fact not only brings the highest reward, but is also a definite incentive to greater effort and larger success.

To one and all we wish this realization and in the year so soon to come, we hope that your prosperity will eclipse all previous experiences.

THE J. B. FORD CO.
Sole Mnfrs.
Wyandotte Michigan

SOLVAY

STANDARD IN SODA SINCE 1881

The Proper Product for the Particular Purpose

There are various forms of alkali for metal cleansing, which differ in their composition and chemical action. To secure satisfactory results, the proper alkali product should be selected for the particular purpose in view. We will be very glad to study your problem with you and give you the benefit of our experience.

THE SOLVAY PROCESS CO.
Detroit, Mich. Syracuse, N. Y. Hutchinson, Kan.
WING & EVANS, Inc., Sales Agent
40 Rector St., New York, N. Y.
Boston Cincinnati Cleveland Detroit Pittsburgh
Chicago Syracuse Indianapolis

KALYE

(Trade Mark)

FOR PREPARING METAL SURFACES FOR PLATING, &c.
SAMPLE CAN SENT FREE

Correspondence Solicited Mention This Journal

H. M. ANTHONY CO., Agent
261 Greenwich St., New York

YOU DON'T KNOW WHAT REAL CLEANING BEFORE PLATING IS—UNTIL YOU HAVE USED

Magnus CLEANERS

Let us prove this to you at our expense

MAGNUS CHEMICAL CO. 718 ATLANTIC AVE., BROOKLYN, N. Y.

Save Yourself Money!
Buy "Jim Dandy" Sewed and Loose Buffs NOW!

THE ODEN CORPORATION
College Point, L. I. New York City
Compositions Buffs Platers Supplies

Rotary Drum Crescent used by Kennedy Valve Mfg. Co., Elmira, N. Y.

Cleans pipe fittings at high speed —*without injury!*

THIS Rotary Drum Crescent cleans—*at half its normal speed*—20 tons of threaded pipe fittings daily for Kennedy Valve Mfg. Co., Elmira, N. Y.

The work being cleaned is *not lifted or thrown about.* It is gently turned—or wormed through a small arc of the drum by special helicoid flights. The smooth, rapid, turning motion exposes all surfaces of the work to the powerful Upper and Lower Revolving Streams—an *exclusive,* patented Crescent idea.

50% saving in labor

Mr. J. C. Kennedy, Works Manager, writes:

"The machine cleans our product thoroughly, uniformly and without injury. It saves us 50% on labor and has made it easier to keep good help."

Crescents for every cleaning need

General Motors, Westinghouse, Ford Motor Co., International Harvester and hundreds of other manufacturers use Crescents for cleaning work ranging from screw machine products to tripoli-buffed aluminum.

Write for our booklet "Washing Metals by Machinery"

CRESCENT WASHING MACHINE CO.
87 Second Ave., NEW ROCHELLE, N. Y.

Crescent
WASHING MACHINES
for Cleaning Metals

7 YEARS *of* Perfect Plating with O.P.C.

This Advertisement is one of a series based on actual occurrences in the

SEVEN years ago a large metal specialties plant adopted Oakite Platers' Cleaner for cleaning brass and steel stampings before nickel plating.

They had been running as high as 30% rejects with former cleaner. A test run of 100,000 parts with O. P. C. showed a perfect plating score, and a reduction in cleaning costs amounting to 50%.

An Oakite Service Man, on one of his recent visits to this plant reported: "They have now been using O. P. C. for 7 years. The present cleaning tank has been running over a year without being dumped. Plating results continue perfect."

It should mean much to you to overcome your plating troubles due to poor cleaning—not for a day or a month but forever. It is our wish to help you get better results and to save money.

Ask us to send an Oakite Service Man to see you—without obligation. If you will combine his experience with your own—you are certain to profit.

There are 70 Oakite Service Men, cleaning specialists, located at:—

Allentown, Pa., Atlanta, Ga., Baltimore, Boston, Bridgeport, *Brooklyn, Camden, Canton, O., Charlotte, N. C., *Chicago, *Cincinnati, *Cleveland, *Dallas, *Davenport, Dayton, *Denver, *Des Moines, *Detroit, Flint, Mich., Grand Rapids, Harrisburg, Hartford, *Indianapolis, *Kansas City, *Los Angeles, *Milwaukee, *Minneapolis, *Montreal, Newark, New Haven, *New York, *Oakland, Calif., Philadelphia, Pittsburgh, *Portland, Me., Poughkeepsie, Providence, Reading, Rochester, Rockford, Rock Island, *San Francisco, Schenectady, *Seattle, *St. Louis, Syracuse, Toledo, *Toronto, Utica, Waterloo, Ia., Williamsport, Pa., Worcester.

***Stocks of Oakite Materials are carried in these cities**

Oakley Chemical Co. *General Offices:* 18 Thames St. New York, N.Y.

OAKITE
Trade Mark Reg. U. S. Pat. Off.
Industrial Cleaning Materials

It's Free

—REMOVES BUFFING GREASES, TRIPOLI, EMERY PASTE AND MINERAL OILS FROM ANY METAL SURFACE.

Greasalt Products Corporation
1966 Broadway, New York City

Mail this COUPON signed to—
GREASALT PRODUCTS CORPORATION
1966 BROADWAY NEW YORK CITY
and we will deliver 5 Pounds Prepaid.

*Name*_____
*Address*_____
*Company*_____

To Clean —Yet to Save

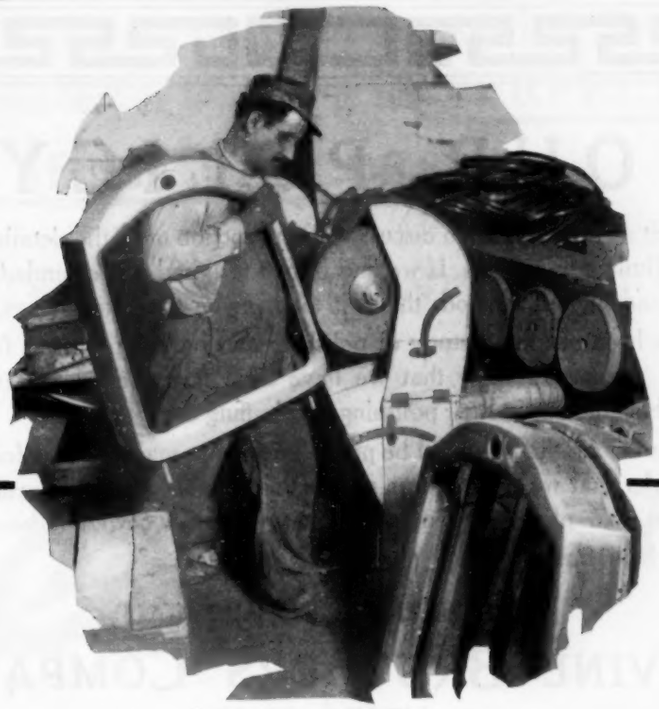
GETTING your work clean is not your most serious problem. Many cleaning jobs require only a light alkaline wash. But to combine *thorough* cleaning with *economy* is difficult and unusual. With a brisk flushing of a strong, active solution of alkali, properly proportioned to counteract the hardness of the water, cleaning is frequently complete —but the cost is high, too high for modern production limits.

This is recognized in ESCOLITE MINERAL CLEANER, the most scientific, low-priced cleansing compound in existence. Strong as an alkali, efficient on solid dirt, quick rinsing, long-lasting and easy to use. Simply mix your solution and go ahead. Clean work—money saved. Good for all cleaning. Stocks in Cleveland and Detroit.

Order today and begin your saving

ESCOLITE
PATENTED JUNE 13 1922
MINERAL CLEANER
SAVES

THE OWLES DETERGENT CO.
Cleaning Compounds
559 West Jackson St., Lockport, N. Y.



More Efficient Polishing

A New Wheel That Does Quicker, Smoother Work and Lasts Longer

BRUKO

Bruko Buffs

Quality of Cloth
Bleached and unbleached, 64/68 count, 3.50 weight, 36-inch width cotton.

Kinds
Loose or stitched, whole piece or pieced.

Sizes
2, 3, 4, 6, 8, 10, 12, 14, 16, 18 and 20-inch diameter.

Arbor
Any size specified.

Stitch
¼ and ⅜ sewing.

Thread
Nos. 24-4 & 16-4 & 12-4 & 10-4.

Bruko Buffs and Polishing Wheels are built on an entirely new principle that results in more satisfactory jobs—and cuts down on buffing and polishing wheel costs.

Due to their scientific construction, there are no heavy spots and no light sides. Running at 2500 revolutions a minute, Bruko Buffs and Polishing Wheels give a fine, smooth finish to the metal,—there's no vibration, no variation in the surface of the buff. Until completely worn down Bruko Buffing and Polishing Wheels retain perfect balance.

Bruko Buffs or Wheels are made from first grade muslin, canvas, sheepskin or leather. Each layer that makes up the section or wheel is of uniform thickness at all points, and is carefully and firmly sewn.

If you use buffing wheels, order a Bruce Buffing and Polishing Wheel today. Compare the work it does. Note that it outlasts ordinary wheels and not only saves you money in purchase costs, but enables your men to do better, cleaner, faster work.

Bruce Products Corporation

173 East Woodbridge Street **Detroit, Michigan**

Branches:

CLEVELAND, OHIO
30 Euclid Arcade

CHICAGO, ILL.
10114 Winston Avenue

PHILADELPHIA, PA.
1830 Green Street

WINDSOR, ONTARIO, CANADA
Box 36

CINCINNATI, OHIO
Room 507-H, Edward Bldg.

OUR POLICY

We solicit an opportunity to discuss with production men, the details of Polishing and Buffing operations. If we find from our varied and extended experience that we can suggest methods that will permit you to make savings, we do so.

We have been making a study of polishing and buffing problems for a period of thirty years and know that we have been instrumental in saving others appreciable amounts in their polishing and buffing costs.

We do not claim that it would be possible for us to make savings for everyone, but in order that we may determine whether or not we could accomplish any savings in your plant, we would ask that you open correspondence with us.

May we hear from you?

ENGINEERING DEPARTMENT

DIVINE BROTHERS COMPANY

UTICA, N. Y.

KRIGNER BUFFING COMPOSITION

You can reduce your Buffing and Coloring costs if you use the composition best suited to handle the operation.

Our expert knowledge acquired over a long period fits us to serve you with compositions particularly adapted to perform the task.

Tripoli composition made from High Grade Tripoli powders, properly bonded with pure grease, adheres to the Buffing Wheel instead of clogging the blower pipes.

Krigner's Brass Coloring Composition gives a clean "shine" on Brass, Aluminum, Copper and die cast metals. It is made from fine powders, and soluble grease, thus leaving "no smutty" surfaces on the finished job.

American Beauty White Finish is particularly adapted for "shining" nickel plated Stove Castings.

White Carnation White Finish produces a bright, clean lustre on Brass and Nickeled parts where a high color is desired.

Manufacturing Buffing Compositions is our business. Let us help you improve the finish on your product.

Samples For The Asking

KRIGNER TRIPOLI CO.

425 So. Campbell Ave. **Telephone, Cedar 1483** **Detroit, Mich.**

"Answering your recent letter regarding Pressto Shredded Leather this material is giving us **PERFECT SATISFACTION AT A MINIMUM COST"**

THAT'S WHY THIS PROMINENT MANUFACTURER USES

Pressto Shredded Leather

Registered U. S. Pat. Office

FOR DRY BARREL TUMBLING

Its Natural Polishing Qualities
Produce Results

WORKING SAMPLE CHEERFULLY FURNISHED

MADE - AND - GUARANTEED - TO - SATISFY - BY

YORKVILLE MANUFACTURING CO., INC.

35 BROADWAY, BROOKLYN, NEW YORK

AMERICA'S LARGEST MANUFACTURERS OF SHEEPSKIN WHEELS

Ninety-eight Years *THE* *Twelve Months*

BACON RECORD

The easiest thing in the world to do is to find out the most economical way to cut your polishing room costs.

Over 49/50ths Of A Century

has taught us more than can be learned in a shorter time.

The way to most effectively and economically cut your
POLISHING ROOM COSTS
is to write to someone who knows.
We know.
Don't fail and then talk about what you should have done.

FELT WHEELS
of all consistencies

WHITE FELT
rock hard, hard and soft

GRAY FELT
rock hard, hard and soft

We are the originators of the celebrated
SPANISH WHITE FELT WHEELS

OUR PRICE IS PRACTICAL

Bacon Felt Company

Winchester, Mass.

EASTERN'S

WHITE SPANISH FELT WHEELS

U. S. A. BRAND

QUALITY GOODS—BUILT TO WEAR

U. S. A. Brand
are wheels of service.

Wearing longer they lessen Felt requirements
and
REDUCE YOUR COSTS.

Every test has proven they stand for all the name represents.

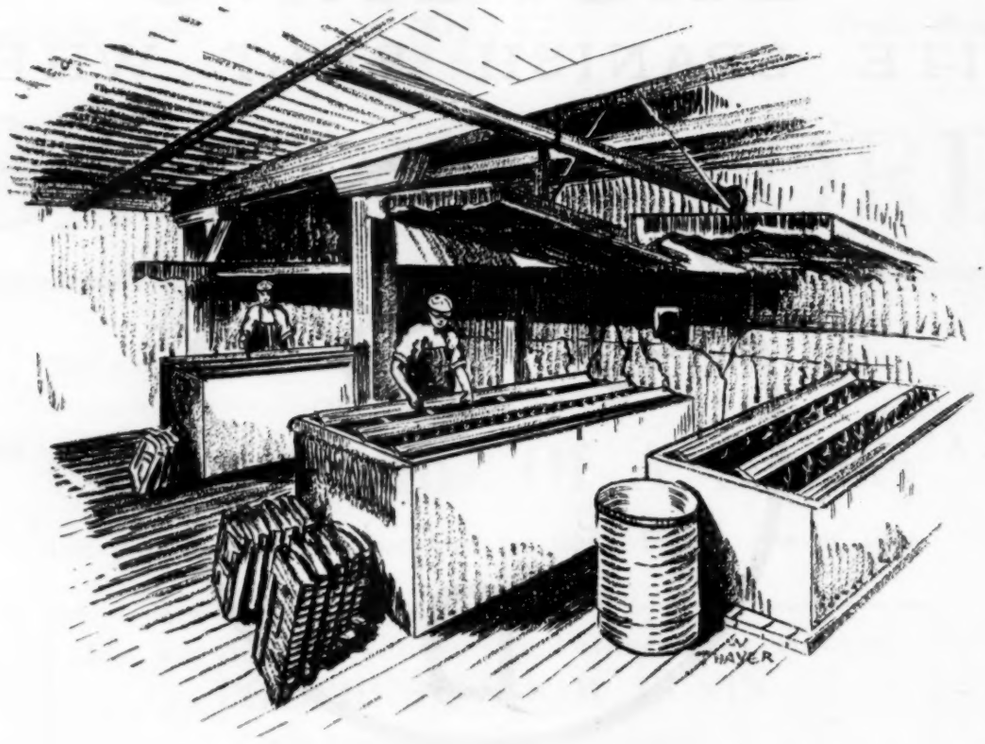
SHEET FELT—in all grades

The lightness of our Felts—per sheet—in any degree of hardness
proves purity of articles used in manufacturing by
Natural Process of Felting

Closely Felted———No Soft Spots.

SAVE TIME AND MONEY
USE EASTERN'S PRODUCTS.

Eastern Felt Company **Winchester, Mass.**



The best test is the tank test— R&H CHEMICALS

have proved reliable for plating solutions for over 40 years

"If the plater needs it we have it."

Cyanegg Copper Nickel Chloride
Sulfocyanide Polysulphide
Zinc Silver Cyanide Sodium Stannate
Nickel-Salts — Single — Double

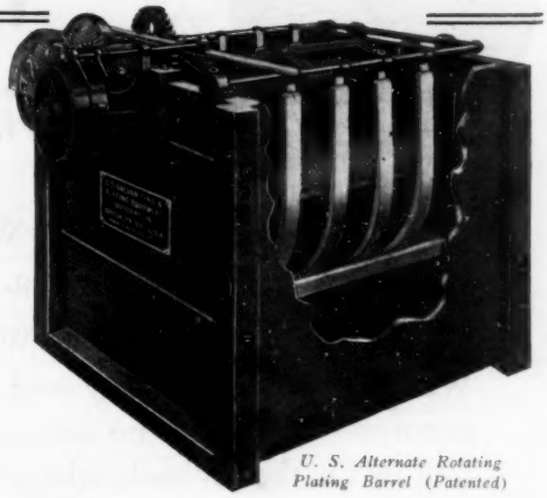
The ROESSLER & HASSLACHER CHEMICAL CO.

709 SIXTH AVENUE, NEW YORK

U. S. AUTOMATIC APPARATUS

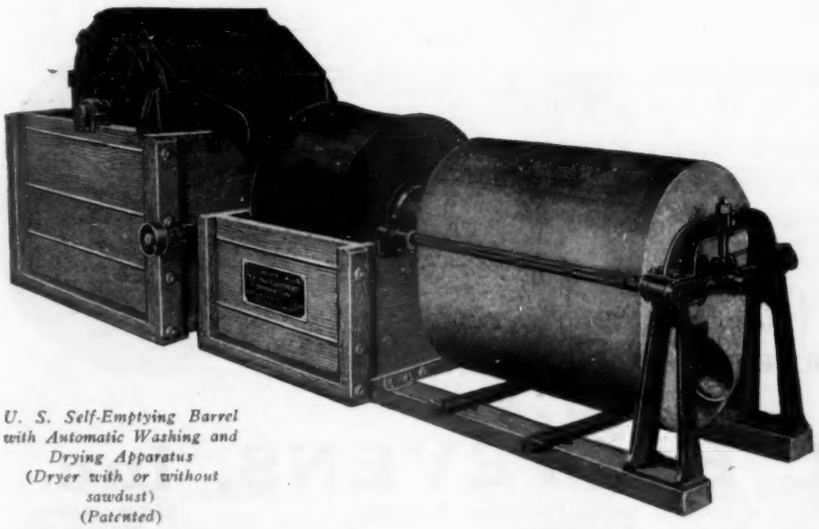
PLATING — CLEANING — PICKLING — ACID DIPPING — RINSING — DRYING SMALL MATERIALS IN BULK

U. S. Self-Emptying Plating Barrel (Patented) Bulletin 101-A



U. S. Alternate Rotating Plating Barrel (Patented)

U. S. Automatic Cleaning, Pickling, Acid Dip, Neutralizing, Rinsing and Drying Apparatus (Patented)



U. S. Self-Emptying Barrel with Automatic Washing and Drying Apparatus (Dryer with or without sawdust) (Patented)

The automatic plating and finishing of small materials in bulk—

Cuts costs
Saves time
Saves labor
Saves material
Saves floorspace
Improves quality
Boosts production
Standardizes control
Increases efficiency
Lowers "overhead"
Eliminates dirt

With no obligation to you, our Service Department will survey your requirements and specify apparatus and layout most suitable for you.

U. S GALVANIZING & PLATING EQUIPMENT CORPORATION
32 Stockton St. Brooklyn, N. Y.

U. S. GALVANIZING & PLATING EQUIPMENT CORPORATION

MANUFACTURERS – INCORPORATED 1896

FELT-SUB POLISHING WHEELS

Just what the name implies.
A substitute for Spanish Felt Wheels.

WHAT IT WILL DO—A Wheel which will do everything that a Felt Wheel will do, except buffing.

IT WEARS LONGER—When necessary to reset a FELT-SUB WHEEL, the old emery and glue is washed off—the wheel is waterproofed—so there is no consequent wear on the wheel as is the case with Felt or Leather Wheels where the old emery and glue is roughed off with files or emery sticks.

IT DOES MORE WORK—It does not glaze over quickly as will other wheels and a "setup" lasts longer.

IT DOES BETTER WORK—A FELT-SUB WHEEL set up with No. 140 Emery will cut as fast as other wheels set up with No. 120 Emery and accordingly will give a finer and better lustre.

ITS COST—A FELT-SUB WHEEL costs less than one-half as much as a Spanish Felt Wheel and about one third less than a Leather Wheel.

An automobile hardware company in Detroit has purchased over 600 FELT-SUB WHEELS this year.

An automobile company in Detroit has purchased over 500 FELT-SUB WHEELS this year.

An eastern manufacturer of bumpers has purchased over 400 FELT-SUB WHEELS this year.

A TRIAL WILL CONVINCE YOU.
WRITE FOR SPECIAL BULLETIN.

FREDERIC B. STEVENS, Inc.

INDIANA BRANCH:
Hoosier Supply Co.,
138 South Delaware Street,
Indianapolis, Ind.

NEW ENGLAND BRANCH:
Frederic B. Stevens, Inc.,
51 Chestnut Street,
New Haven, Conn.
Edward R. Sutton, Mgr.

Manufacturer of Foundry, Electro-Plating and Polishing Supplies and Equipment
Cupola Blocks, Fire Brick and Clay
Corner of Third and Larned Streets
DETROIT, MICH.
Or order from the nearest branch
CANADIAN BRANCH: Windsor, Ont.

PENNSYLVANIA BRANCH:
Frederic B. Stevens, Inc.,
250 West 12th Street, Erie, Pa.
Charles J. Mensemer, Mgr.

MILWAUKEE BRANCH:
Frederic B. Stevens, Inc.,
1350 National Avenue,
Milwaukee, Wis.
A. M. Weis, Mgr.

THE MUNNING REMINDER

A Memory Jogger for the Plater and Polisher

VOL. I, No. 1 MATAWAN, N. J., and CHICAGO, ILL. December, 1923

Five Fundamentals of Our Business

1. That our quality shall always be the best and always be uniform.
2. That we shall have a one-price standard, as a matter of common honesty.
3. That the rights of our customers shall always be protected.
4. That our employees are associates.
5. That we shall apply the Golden Rule to all our business transactions.

Grinding and Polishing Motors

Munning A. C. and D. C. Grinding and Polishing Motors have been specially designed to provide simplicity and ease of operation, large working radius around wheels, high efficiency, quiet running and dust proof construction. Their distinctive features make them the preferred motors.

Brushes

Every Munning brush is sold with the guarantee that there is no substitution of imitation brush stock or admixture of inferior materials. The best bristles for brush making are from the long haired pigs of Russia and China and all bristles used in Munning brushes come from these two countries. There is a style and size of Munning brush for every plating and polishing requirement and each one is made with the sole idea of producing the best brush for the work to be done.

Polishing Wheels

Polishing wheels are made of canvas, duck, cotton cloth, wood (leather faced), walrus or seahorse, white sheepskin, russet sheepskin and felt. Munning polishing wheels represent the best possible quality of materials and workmanship. Much useful data which we have collected and classified regarding the ordinary and special problems of polishing is available on request.

Munning Cleaners

Munning Cleaners include soap, caustic and non-caustic alkali types, especially suited for iron and steel or the softer metals. They are uniform and low-priced and can be used with or without electric current.

Red-E-To-Use Face for Buffs

The Red - E - To - Use Process, which is controlled by fundamental patents, automatically produces the face required for buffing and simultaneously impregnates the fibre ends with a special compound that enables the buff to take the polishing compound at the first touch. Unbalanced buffs cannot be Red-E-Faced and consequently are automatically rejected. Thus the most important objection to the pieced buff is entirely removed.

The Triplex Buff

The Triplex Buff is made by interleaving around the arbor hole full disks of sheeting, which have been folded into quarters. These are then machine stitched between two cover disks to hold them in position. This novel method of construction places the thread ends instead of the sides of the threads against the work. Greater efficiency and economy in buffing is thus secured.

Cutting Down Compositions

Munning cutting down compositions include emery paste, emery cake, tripoli, pumice and soft silica, the latter being intermediate between a cutting and finishing composition. The raw materials for all Munning compositions are selected with the greatest care and these are properly blended by special processes with special machinery which absolutely controls the inherent variations of the raw materials.

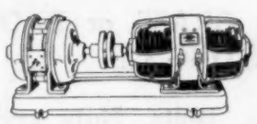
Finishing Compositions

Lime, rouge and crocus are the principal finishing compositions but these, like cutting compositions, require expert knowledge to produce. For this reason A. P. Munning & Co. in the preparation of Finishing Compositions carry out in their own factory all processes such as calcining, washing and compounding. A special bulletin on Cutting and Finishing Compositions will be mailed you on request.

Lime Finishes

Zucker's Acme White Finish is the original lime finish and although there have been many imitations and modifications, it remains the international finish by which all other grades are measured. It is unquestionably the best lime finish for a large majority of all work. Acme Pink Finish, Specialime, Stovelime and Bulldog are other lime finishes made by A. P. Munning & Co. for different classes of work.

Motor-Generators and Belted Generators

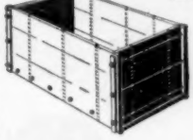


Optimus generators both motor-driven and belt-driven are especially designed for the particular classes of work desired. None of the parts ordinarily used in higher voltage power apparatus have been used, but the same high engineering standards have been maintained in the building of these generators for low voltage work. In many plants where the selection of generators for low-voltage work has been placed upon electrical engineers, the decisions have been flattering testimonials to the Optimus.

Voltmeters and Ammeters

The selection and correction installation of ammeters and voltmeters is vitally important. Most plating rooms have too few rather than too many electrical measuring instruments.

Wood Tanks



The little sketch shows the construction of Munning rectangular tanks. Each part of the tank is accurately fitted and secured by wrought iron rods passing entirely through the sides and bottom as indicated by the dotted lines.

Dipping Baskets

Steel, copper, brass, aluminum, monel or nickel chromium wire are used for Munning dipping baskets. They may be had in various shapes and made with different mesh of wire cloth. Earthenware dipping baskets are also supplied.

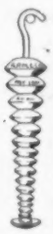
Carboy Rocker

The "Nonesuch" Carboy Rocker permits one man to easily move a full carboy to any desired place and entirely empty it from the first to the last pitcherful without spattering a drop.

Goggles, Gloves and Shoes

Wide vision goggles, Gem Respirators, rubber gloves, rubber aprons, rubber finger cots, and wood sole shoes are some of the minor necessities of the buffing and plating room obtainable from A. P. Munning & Co.

The Munning Quoit Anode



The Quoit Anode absolutely prevents scrap waste by using a nonsoluable metal spine over which additional Quoits are slipped to replace those consumed in actual plating. The quoit shape provides a large surface in proportion to its weight. Steadily increasing sales attest its popularity and economy.

Plating Salts

Munning engineers have consistently recommended the purchase of standard salts as separate ingredients (not prepared salts or mixed compounds). The plater can and should maintain balance in his solution by adding only the required ingredients.

Optimus Plating Barrel

Six troughs on the outside of the Optimus Cylinder pick up a portion of the solution from the tank and pour it through the perforated panels into the cylinder thus preventing the solution within the cylinder from becoming impoverished.

The Big Catalog

It contains authentic and valuable information on machines and materials used in the buffing and plating room. It is full of the very things every progressive foreman in polishing and plating rooms wants to know. Write immediately for your copy.

Munning Directory

Factories

Matawan, N. J., and Chicago, Ill.

Sales Offices

New York.....52 Vesey Street
Chicago.....2920 Carroll Avenue
Detroit....718 Free Press Building
Philadelphia .....Bourse Building
Cleveland, O.....1604 E. 73rd St.
Springfield, Mass.....43 Ft. Pleasant Avenue
Syracuse, N. Y.....306 City Bank Building
Grand Rapids..1530 Monroe Ave.

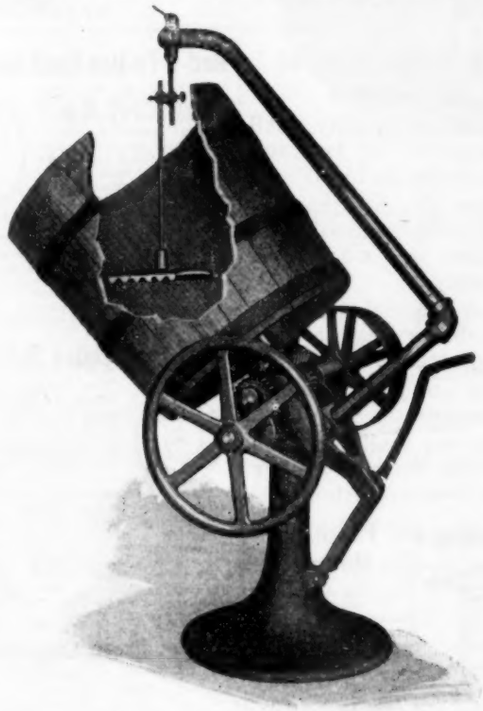
Agencies

Cutter & Wood Supply Co.....Boston, Mass.
Geo. L. Claflin Co.....Providence, R. I., and Attleboro, Mass.
Industrial Supply Co., Inc.....New Haven, Conn.
E. A. Kinsey Co..Cincinnati, Ohio
Frost-Naus Company.....Minneapolis, Minn.
G. S. Robins & Co..St. Louis, Mo.
F. O. Stallman Supply Co.....San Francisco

CROWN BARRELS
FOR PLATING — FOR TUMBLING

CROWN TILTING PLATING BARREL
for
NICKEL, COPPER, BRASS or BRONZE PLATING

Screws, Washers, Bolts, Nuts and Similar Small Parts



The illustration to the right shows the simple construction of this barrel and the ease and convenience of operation will be apparent. This barrel can be raised or lowered to any angle while plating. Our special shape of anode for this barrel and the adjustable feature make for the highest efficiency for all solutions.

We also handle other types of plating barrels for other classes of work. Give us your problems to solve.

MADE IN THREE SIZES

CROWN TUMBLING BARRELS

The CROWN TUMBLING BARREL is made of cast iron with water tight cover and inside ribs.

This barrel was designed for wet or dry tumbling of steel, iron and brass parts in soda solution, sand, leather or saw-dust.

Large hand hole 8 inches in diameter with gasketed water tight cover and the rounded contour makes emptying rapid and easily accomplished.

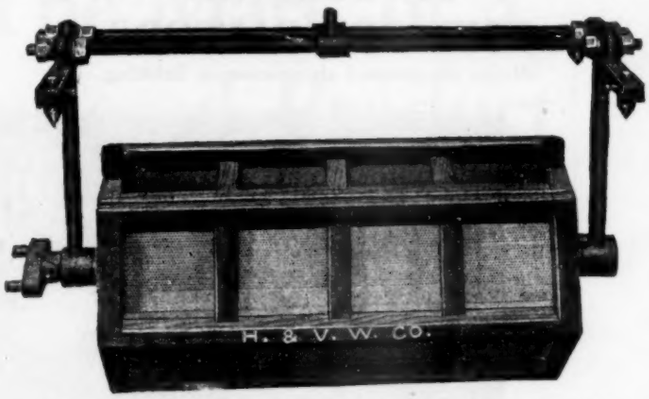
We Supply Everything for the Plater and Polisher.

Crown Rheostat & Supply Co.
31-33 So. Desplaines St. Chicago, Ill.

Inside Anode Plating Barrel

PATENTED

While we manufacture both the old type and Inside Anode Type Apparatus, we strongly recommend the latter for the following reasons:

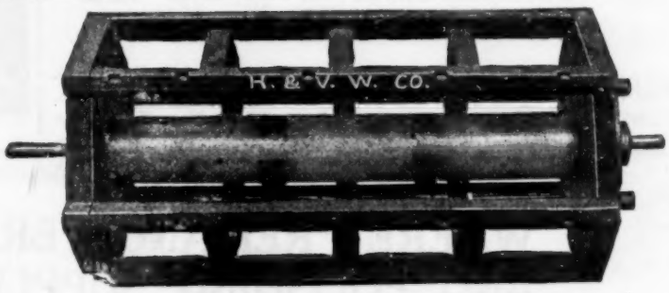


Horizontal Celluloid Plating Barrel Only (External View), Complete

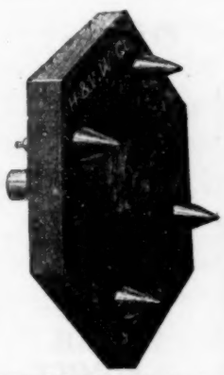
Where the Inside Anode Type Apparatus is used the same thickness of deposit can be obtained in less than one half the time required with the old type apparatus, thus decreasing not only the investment cost but also the labor cost per pound of finished work.

The Inside Anode Type Apparatus operates successfully on a 5 to 6 volt circuit, making it unnecessary to use a special high voltage dynamo or one of a three wire system, with its well known disadvantages.

These features are protected by U. S. Patents.

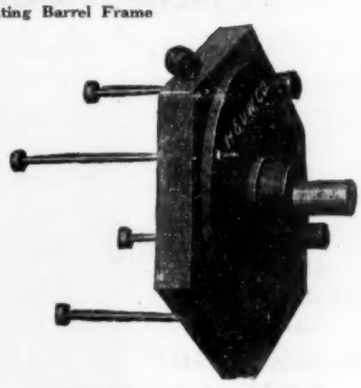


Horizontal Plating Barrel Frame



Conical End Cathode Contacts

We illustrate an external view of Inside Anode Type Barrel, showing self-aligning clutch as well as skeleton view showing inside anode protected by celluloid cylinder, the anode being readily removable through end of barrel. We also show two of the most popular styles of cathode contacts. While these styles are the ones most generally used, we are prepared to furnish other styles to meet unusual requirements.



Pin End Cathode Contacts

Manufactured by

The Hanson & Van Winkle Company

NEWARK, N. J.

New York, 70 Lafayette Street **Detroit, 1940 Rivard Street**
Chicago, 842 West Erie Street **Cleveland, 1434 West Third Street**
Providence, 36 Garnet Street

CANADIAN—HANSON & VAN WINKLE CO., LTD., TORONTO, CANADA

DO IT WITH AIR

You will get a better finish
save money, time and labor.

EUREKA SPRAYERS

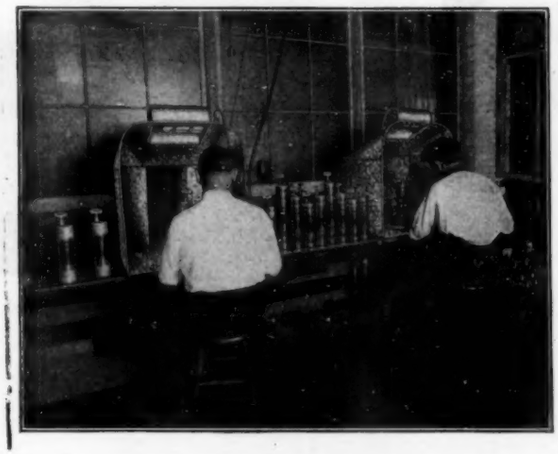
Use lower pressure, less power,
less material, do better work.

AN OUTFIT FOR EVERY PURPOSE

Deal with a reliable house.

—THE ORIGINATORS—

Of the compressed air process of finishing.



WE MANUFACTURE OUR OWN

AIR COMPRESSING, SPRAYING AND EXHAUST EQUIPMENT

EUREKA PNEUMATIC SPRAY CO., INC.

130th Street and Jamaica Ave., Richmond Hill, New York City

WHERE "RELIANCE BRAND" PLATING AND POLISHING SUPPLIES ARE MADE

Service — *Quality* — *Price*

Anodes
Platers' Chemicals

Dynamos
Polishing Lathes

Plating Barrels
Tumbling Barrels

Etc.

BUFFS
COMPOSITIONS

WHEELS
EMERY

GLUE
PUMICE

ETC.

EVERYTHING FOR THE PLATER AND POLISHER
WE WILL WELCOME THE OPPORTUNITY OF SERVING YOU

CHAS. F. L'HOMMEDIEU & SONS CO.

MANUFACTURERS

General Office and Factory: 4521 OGDEN AVE. Salesroom: 26 S. CLINTON ST.

CHICAGO

Rust-Proofed
By the Famous
PARKER PROCESS

The Mark of a Bettered Product

Any product manufactured from iron or steel is better for being Parkerized.

For Parkerizing does not affect the physical properties or form in any way. Size and contour are unchanged; heat treatment, magnetism and tensile strength remain the same; but the surface of all parts processed *are rendered immune to rust.*

To distinguish the products that have been made better by Parkerizing, we have adopted this mark which may be used by manufacturers who are licensees or who have their product Parkerized by one of the licensed jobbers.

The following concerns are operating Service Plants under Parker License. They are at your service.

Parker Rust-Proof Co. of Ohio, 2617 E. 76th St., Cleveland, Ohio.

Western Rust-Proof Co., 1040 W. Lake St., Chicago, Ill.

Pyrene Manufacturing Co., Parkerizing Dept., 520 Belmont Ave., Newark, N. J.

Philadelphia Rust-Proof Co., Howard at Montgomery Ave., Philadelphia, Pa.

Rust-Proofing & Metal Finishing Corp., 3951 Hayward St., Cambridge, Boston, Mass.

St. Louis Rust-Proof Co., 514-516 S. Broadway, St. Louis, Mo.

Larson Tool & Stamping Co., Parkerizing Department, Attleboro, Mass.

Victor Manufacturing Co., 11 St. Mary's St., Dayton, Ohio.

Parker Rust-Proof Co.
2176 Milwaukee Ave., Detroit, Michigan

THE DEPENDABLE

as the Doctor Specialist

SHOULD one of your family suffer ear trouble, you would call an ear specialist; a broken limb, a surgeon. You naturally would want a man who concentrated his study in the particular field, and knows that field thoroughly.

In japanning, the specialist is the Hilo Service Salesman. Years of contact with every kind of finishing, are his background. He speaks with authority on materials and their use; methods of obtaining particular finishes, etc.

Back of the Hilo Service Salesman is our experience of 60 years, and a laboratory to save you the trouble of small experimental work.

Perhaps you've been thinking of some change in your japanning,—an improved finish, maybe quicker results.

Send for the Hilo man; try out this dependable co-operation. It involves no obligations.

HILO Trade Mark

HILO VARNISH CORPORATION
(Moller & Schumann Co.)
1 Gerry St. BROOKLYN, N. Y.
104 Hanover St., Boston
2420 Washburne Ave., Chicago

"Save the surface and you save all"

Call in a HILO SERVICE SALESMAN

Ever Have These TROUBLES in Your Finishing Room?

—Quality of finish uncertain or falling off
—Production costs running too high
—Labor turn-over increasing
—Bad working conditions
—Delivery promises hard to meet

Unnecessary Troubles—every one of them, as thousands of the country's leading manufacturers gladly testify. These manufacturers at some time experienced a part or all of these difficulties. It's a different story now and has been ever since they investigated and installed the

DeVilbiss Spray-painting System

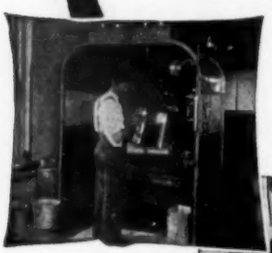
If you have any of the finishing problems here outlined, or if you desire to improve finishing room operation, consider how the DeVilbiss System can help you.

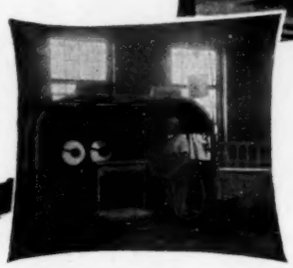
This System's long and enviable performance record of making good in thousands of plants is due to equipment that is practical, complete and reliable.

Varnishes, enamels, lacquers and all other finishing materials are applied with the DeVilbiss spray gun on any kind of surface. A small, round or a wide, flat spray can be produced with the DeVilbiss spray gun, **at the lowest practicable air pressure,** to meet every requirement. The DeVilbiss sprayed coating is even, uniform and free from defects.

Ease and speed of DeVilbiss spray gun operation insures 4 to 5 times faster work than hand brushing. The finishing operation is made cleaner and more healthful with the DeVilbiss System, and upkeep and operation costs are negligible.

Get all the facts—a line from you will bring information it will pay you to have. Let us help you.





The DeVilbiss Mfg. Co.
266 Phillips Ave. Toledo, Ohio

For painting your factory buildings—inside or out—DeVilbiss Portable Spray-painting Equipment will do a better job and save 50 to 80% of the labor cost.

The "IDEAL" PONY AIR COMPRESSOR and TANK

OUR PONY "IDEAL" OUTFIT

is provided with a horizontal Tank, Air Compressor, electric Motor, Safety Valve and Tubes. It is the best space saving equipment on the market, can be easily moved around and is always ready for work. Costs only 1c. per hour to run.

Price $70.00 only.

When ordering specify if you have Direct or Alternating current; also voltage and cycles.

This outfit will operate our
Pint Glass Jar Sprayer, the price of which is $12.00
½ Pint Glass Jar Sprayer, the price of which is 8.00
4 Oz. Glass Jar Sprayer, the price of which is 4.00

THE IDEAL AIR BRUSH MFG. CO.
203-205 LAFAYETTE ST. NEW YORK
Telephone Canal 5333

ADD TO THE POPULARITY OF YOUR PRODUCT

One of the surest ways to do so is to improve its appearance by the use of a superior quality of

BAKING AND AIR DRYING ENAMELS

You furnish the product and let us furnish the finish. For suggestions as to improvements address, H. G. Kittredge, Vice-President.

K&S *The* KAY & ESS COMPANY
VARNISH MAKERS
DAYTON, — — OHIO.

"Built for Service"

THE NEW
Economy No. 11 Air Sprayer

This sprayer can be used either with Jar or bucket. Its connections are made for either. The cap on Jar is made from Aluminum.

Price - - - $10.

SIMPLE PRACTICAL
DURABLE ECONOMICAL

Applies paint, varnish, lacquer, enamel, bronzes, etc., at low pressure. Standard jar is used.

Circulars on request

MANUFACTURED BY
Economy Machine Products Co.
5212-14 Lawrence Avenue, Chicago, Ill.
SOLD BY ALL LEADING DEALERS.

LACQUERS
AND
LACQUER ENAMELS

M&W Co. 1876

6981 LACQUER
for
POLISHED COPPER,
SILVER AND FINE
FINISHES
WONDERFUL

MAAS & WALDSTEIN CO.
45 JOHN STREET
WORKS, NEWARK, N.J. NEW YORK

AERO BRAND

AMERICAN CYANAMID COMPANY — AERO BRAND — PRODUCTS

COPPER CYANIDE
(70-70½% Metallic Copper)
ZINC CYANIDE
(55% Metallic Zinc)
SILVER CYANIDE
(80½% Metallic Silver)

AERO BRAND Cyanide—made from the air—is the world's most widely and successfully used Cyanide. AERO BRAND Metal Cyanides are of an unequalled and uniformly high quality. Also sold at favorable prices.

American Cyanamid Company
511 Fifth Avenue New York

DISTRIBUTORS

The Harshaw Fuller & Goodwin Co., Cleveland, O.
A. P. Munning & Company, New York
Apothecaries Hall Company, Waterbury, Conn.
Lyman-Beers Company, Springfield, Mass.
Crown Rheostat & Supply Company, Chicago, Ill.
Thos. Buchanan Co., Cincinnati, O.
Grasselli Chemical Co., Cleveland, Ohio
The Industrial Supply Co., Cleveland, Ohio
Thompson-Munro-Robins, St. Louis, Mo.
Frederic B. Stevens, Detroit, Mich.
K. F. Griffiths & Company, New York, N. Y.
Cutter & Wood Supply Co., Boston, Mass.
Scobell Chemical Co., Inc., Rochester, N. Y.
Robt. E. Harrison, Philadelphia, Pa.

BREVOLITE LACQUER

THE impervious and lasting film.

WAUKEGAN CHEMICAL COMPANY
"Values that Endure"
Waukegan Illinois

Steps that lead to a Better Finish

1 The du Pont chemist determines the formula in the laboratory, and a sample mix is made.

2 The sample is applied YOUR WAY and given a practical test.

3 The formula is OK'd or changed, and when OK'd is sent to the factory.

4 Production is then started, each step being checked by the laboratory.

5 Sample of YOUR finish as produced in the factory is sent to the laboratory and is checked against formula and laboratory sample.

6 Sample either is OK'd or rejected. When OK'd, a large sample of factory product is placed in standard sample storage.

7 The laboratory then issues the authorization to ship.

E. I. DU PONT DE NEMOURS & CO., Inc.
Chemical Products Division, Parlin, N. J.

DU PONT

The du Pont method insures your obtaining a uniform product whether you re-order next year or next month.

PYRALIN ENAMELS *and* LACQUERS

Uniform Quality — attained through complete chemical control of each manufacturing step between raw cotton and the finished product.

Du Pont chemical engineers have found the way to give not only remarkable wearing qualities but the unvarying *uniformity* due to exact chemical control from raw materials to finished product.

Nikolas Lacquers

ARE

THE STANDARD OF THE WORLD

—If you doubt it, give them a trial.

Thirty years of uninterrupted success is our best reference.

We recommend:

BEDSTEAD LACQUER
For Brass Beds, Costumers, etc.

S. Z. LACQUER
For Zinc and White Metal Goods.

C. E. 5 LACQUER
For Lighting Fixtures, etc.

D. G. LACQUER
For Aluminum Goods, etc.

No. 1 DIP LACQUER
For Fine Builders & Cabinet Hardware, etc.

A-5 LACQUER
For Silver & Gold Art & Toilet Goods.

A-1 DIP LACQUER
For Silver Hollowware, etc.

WATER DIP LACQUER
For Bird Cages, Cheap Hardware, etc.

No. 2 DEAD BLACK LACQUER
A Fine Imitation Bower Barff Finish for Optical and Scientific Instruments, etc.

No. 5 DEAD BLACK LACQUER
For Switchboards and Electrical Goods.

RUBBER BLACK LACQUER
For Tools and Wood Handles, etc.

WHITE ENAMELS
For Bath Room and Lighting Fixtures.

BRONZING LIQUID "B"
A Wonderful Bronze Powder Medium.

COLORED ENAMELS
For Pencils, Dolls, Artificial Limbs and Polychrome Finishes, etc.

BRONZE POWDERS
All Kinds.

SPRAYING APPARATUS COMPLETE

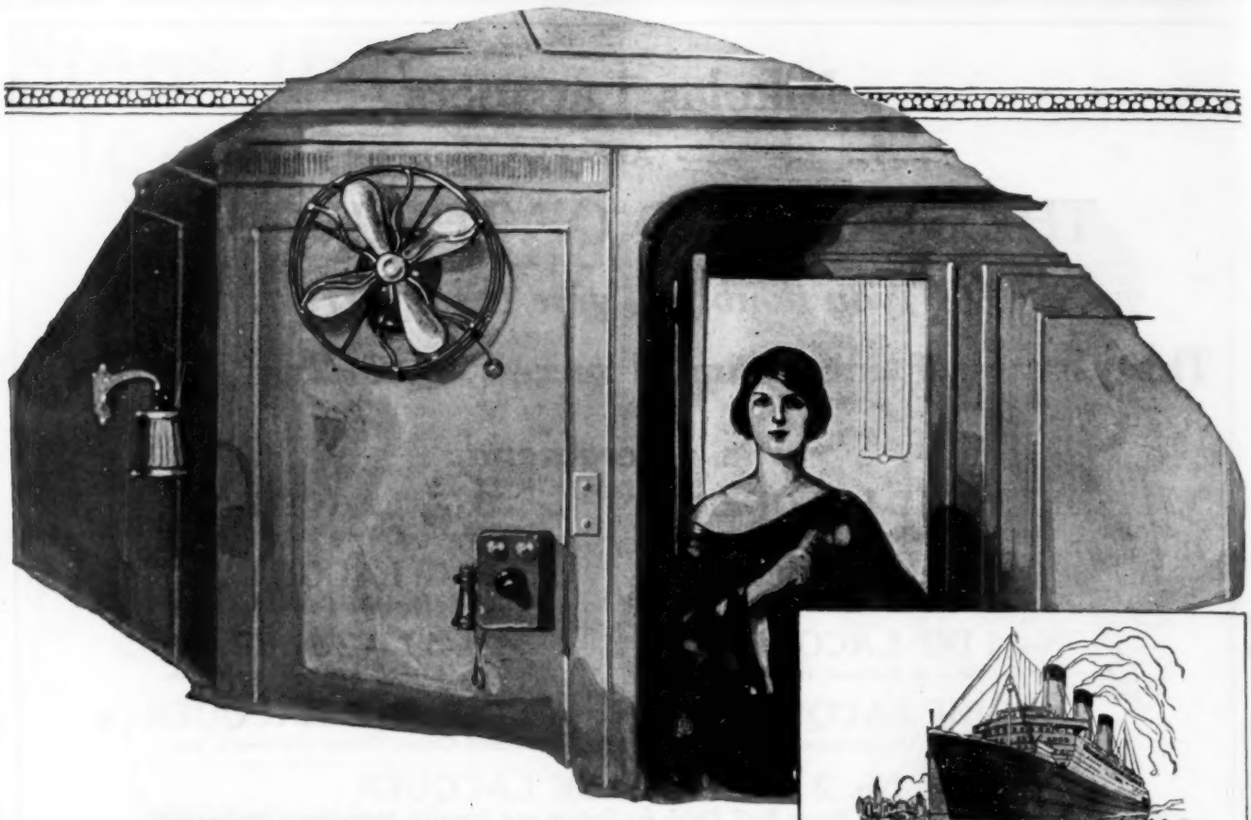
THE NIKOLAS SPRAYER

Over 5,000 in use. No sprayer on the market at any price is better constructed or more efficient. Price $10.00. With agitator for bronze powder mixtures $11.00. We can furnish compressors, exhaust fans, air tanks, motors, hoods, etc.

G. J. NIKOLAS & COMPANY

33-35 Grand Street, Brooklyn, N. Y. 1227-35 Van Buren St., Chicago, Ill.

AGENTS
MEFFORD CHEMICAL CO.
749 So. San Pedro St., Los Angeles Cal.



COMBINED with the advantages that ZAPON provides for protecting metal products against rust, tarnish, discoloration and surface corrosion are these distinctive features: No matter what the desired finish may be—dull black, glossy black or rich, lustrous color—the use of Zapon insures the utmost in beauty and attractiveness of a product.

Zapon, a product of the firm that founded the lacquer industry in America, gives a hard, durable, waterproof and stain-proof finish—a finish that not only enhances the sales value of the article, but one that also adds materially to the length of service the product will give.

The Leviathan

Prominent among the distinctive features that have made the Leviathan "the most completely equipped ship that ever sailed the sea," is the installation of one thousand *General Electric Fans*, each fan specially finished in colors that harmonize with the decorative scheme.

These finishes include mahogany, walnut, light gray, oak, maple, light green, apple green, butternut, cream, bronze, old gold, porcelain, white, tan, French gray, satin wood and others—all made possible through the use of ZAPON, America's pioneer lacquer product.

CELLULOID ZAPON COMPANY
200 FIFTH AVENUE NEW YORK CITY

Branches: Chicago, Los Angeles, New Haven

Our Service Division will gladly assist in determining how you may use ZAPON with profit. Write Desk 13 nearest branch.

ZAPON

ZAPON for metal products Unrivaled

ZELLAC

Increases Sales *and* Cuts Costs

First sales are made easy by the beauty of finish given by Zeller lacquers, lacquer enamels, and bronzings. Zellac products are available in any color, transparent or opaque, and in any degree of gloss.

Repeat sales are increased by the great durability of these grades—exceptional in adhesiveness, hardness, flexibility or resistance to weather and heat, according to the requirements of the work in hand.

Production costs are cut by Zeller products. Under ordinary room temperature they are dry in about 15 minutes. Zeller bronzings demand no priming or copper flash. Zellac covering properties are so unusual that one coat often gives the same finish as two or three of an inferior grade. And in a dozen other ways, individual Zellac finishes reduce the expense of labor, material or both.

Tell us the kind of finish you require, the material and nature of surface, and the present method of applying. Perhaps your letter will lead to profitable improvements in your finishing processes.

Zeller Lacquer Mfg. Co.

342 Madison Ave. New York

Chicago Office: 551 W. Lake St.

No question of their quality

.999 + FINE SILVER ANODES

Our reputation is stamped on every plate

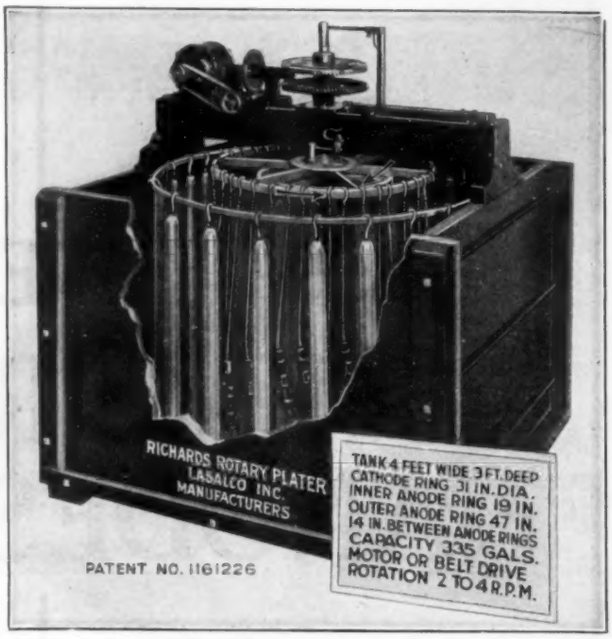
HANDY & HARMAN

General Offices
59 Cedar St., New York City

Plants

Bridgeport, Conn.

29-31 Gold St., New York City


RICHARDS ROTARY PLATER
LASALCO INC.
MANUFACTURERS
PATENT NO. 1161226
TANK 4 FEET WIDE 3 FT. DEEP
CATHODE RING 31 IN. DIA.
INNER ANODE RING 19 IN.
OUTER ANODE RING 47 IN.
14 IN. BETWEEN ANODE RINGS
CAPACITY 335 GALS.
MOTOR OR BELT DRIVE
ROTATION 2 TO 4 R.P.M.

IN **INDIA** THEY PLOW WITH WOODEN PLOWS AND RAISE HALF A CROP

WHY? BECAUSE IT HAS ALWAYS BEEN DONE THAT WAY

IN **PLATING SHOPS** WORK IS BEING PLATED AT A SNAIL'S PACE BY STILL PLATING METHODS

WHY? BECAUSE IT HAS ALWAYS BEEN DONE THAT WAY

WAKE UP! USE MOTION PLATING AND PLATE THREE TIMES FASTER WITH THE

RICHARDS ROTARY PLATER

Write for Bulletin 103

Lasalco Buffs are made for buffing. The buffs last but the buffing doesn't.
Lasalco compositions, white finish, tripoli, etc., are production getters and cost savers.
They stick to the buff but not to the work. Make us prove it.

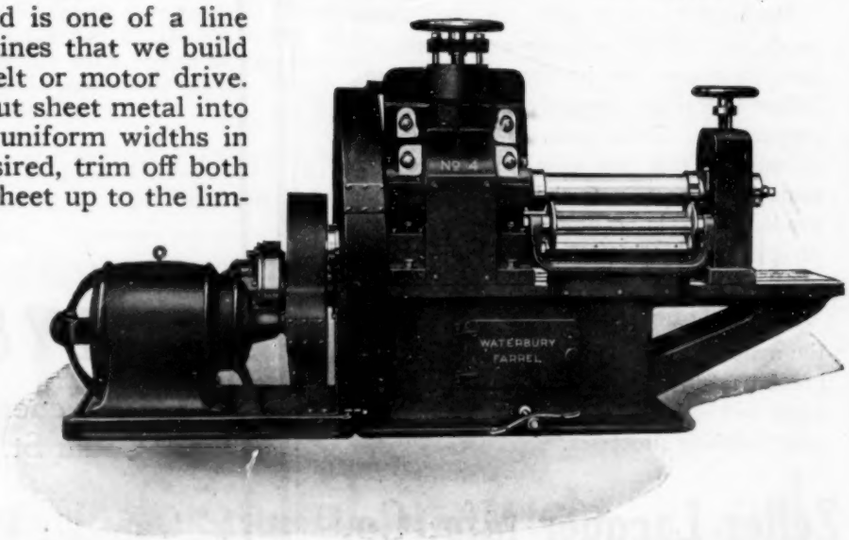
LASALCO, Inc. *Everything for Polishing and Plating. Write for Prices.* 2828-38 Lasalle St. ST. LOUIS, MO.

WATERBURY-FARREL GANG SLITTERS
For Slitting Sheet Metal Into Strips

The machine illustrated is one of a line of Gang Slitting Machines that we build in several sizes with belt or motor drive. They are designed to cut sheet metal into a number of strips of uniform widths in one operation, or if desired, trim off both outer edges of a wide sheet up to the limiting capacity of the spindles.

THE WATERBURY FARREL FOUNDRY & MACHINE CO.
WATERBURY, CONNECTICUT, U. S. A.

Home Office and Works:
465 Bank St., Waterbury, Conn.
Western Office:
1016 Williamson Bldg., Cleveland, O.
FOREIGN AGENTS:
GEO. H. ALEXANDER, Birmingham, England
For Rivet, Bolt and Nut Machinery, also Wire Machines.
FENWICK FRERES, Paris, France,
For Rivet, Bolt and Nut Machinery.
D. WEIL, Paris, France.
For Wire Machinery.



No. 4—24" Gang Slitting Machine (5668)
SPECIAL DIRECT CONNECTED MOTOR DRIVE WITH FRICTION CLUTCH

75 Years of Service

The New Jersey Zinc Company has been at the service of the brass industry for seventy-five years.

Think back, if you can, over the development of your industry in the last three-quarters of a century. Compare the wizardry of your modern methods with the crudities of the early days.

Think how much of that development has been due to a steady supply of pure, uniform, dependable Zinc—secured to you through the standards and ideals of the New Jersey Zinc Company.

The New Jersey Zinc Company

Established 1848

160 Front Street, New York City

CHICAGO · Mineral Point Zinc Company · PITTSBURGH SAN FRANCISCO CLEVELAND The New Jersey Zinc Sales Co.

The world's Standard for zinc products

New Jersey zinc

SCOVILL
MANUFACTURING COMPANY
The Oldest Brass Company in America

TO write the history of the Scovill Mfg. Co.—its mile long plant, its two hundred buildings, and its diversity of products—is to outline the course of industrial growth as it occurred in America the last 121 years.

This great organization — with more than a century of experience in brass craftsmanship is ready to help you in your manufacturing problems—either by supplying the raw materials, such as sheet, wire, rod, and seamless tubing—or else by making those small parts or complete articles which you need.

BRASS MILL PRODUCTS—MFG. GOODS TO ORDER

SCOVILL MFG. CO.

Main Office, Mills and Factories—Waterbury, Ct.

Sales Offices:—280 Broadway, New York.
224 W. Lake St., Chicago. 10 High St., Boston.
Leader-News Bldg., Cleveland. Penna Bldg., Philadelphia.
Rialto Bldg., San Francisco.

ESTABLISHED 1802
SCOVILL
MANUFACTURING COMPANY

A Sign Post of Progress

USE of Brass by the Post Office Department for mail boxes illustrates the trend of modern engineering thought—eliminate waste by using materials best fitted for the job.

To the Government, Brass mail boxes mean the avoidance of expensive maintenance due to rust.

To you also, whether you manufacture or buy, Brass, Copper and Bronze mean economy—long, repair-free service, goods of high quality.

In your home or in your plant, Brass Pipe plumbing and Brass and Copper piping for general service never rust. Copper leaders, gutters and flashings never have to be replaced because of rust.

Brass cuts down manufacturing costs; turns out the highest quality of drawn, spun or stamped metal goods.

Everyone knows that Bronze is unsurpassed for bearing service, as well as where great strength and resistance to corrosion are essential; and for electrical service, or where heat must be utilized economically, Copper has no equal.

This is the message of the Brass mail box—*avoid the waste of materials in uses for which they are unsuited, and reduce costs, by using those metals best fitted for the widest range of service.*

COPPER & BRASS
RESEARCH ASSOCIATION
25 Broadway - New York

Copper, Brass, Bronze *and* Nickel Silver

Sheets, Rolls, Wire, Rods
Seamless and Brazed Tubes

Ambrac Metal, Tobin Bronze, Phosphor Bronze
Manganese Bronze, Benedict Nickel
Extruded Shapes, Die Pressed Parts
Angles, Channels, Circles, Blanks, Shells

Special Alloys for Specific Purposes

ANACONDA
from mine to consumer

The Trade Mark of The American Brass Company identifies Copper and Brass products in which the highest skill in manufacture is combined with the accumulated knowledge and experience of more than a century.

THE AMERICAN BRASS COMPANY
GENERAL OFFICES, WATERBURY, CONN.

MILLS AND FACTORIES
Ansonia, Conn Torrington, Conn. Waterbury, Conn. Buffalo, N.Y. Kenosha, Wis.

OFFICES AND AGENCIES
New York Philadelphia Boston Providence Pittsburgh
Cleveland Cincinnati Detroit Chicago St. Louis San Francisco
ANACONDA AMERICAN BRASS LIMITED, NEW TORONTO, ONTARIO CANADA

Brass :-: Bronze :-: Copper Nickel Silver

IN SHEET, ROLLS, WIRE, ROD AND TUBE. ARCHITECTURAL BRONZE, ANGLES AND CHANNELS, PHOSPHOR BRONZE, NAVAL BRONZE, BUS BAR COPPER, SOLDERING COPPERS, SCREEN CLOTH AND WIRE MESH.

Immediate Delivery From Our New York Stock

T. E. Conklin Brass & Copper Company

Est. 1860 54-60 LAFAYETTE ST., NEW YORK CITY Tel. Franklin 2900

Brass, Bronze, Nickel Silver

SHEETS or ROLLS

Our sheet material possesses a very close grain, and is especially adapted for deep drawing, spinning, etc.

WESTERN CARTRIDGE COMPANY
BRASS MILL DEPARTMENT

EAST ALTON, ILL.

SEYMOUR PRODUCTS

HIGHEST QUALITY

PHOSPHOR BRONZE

COMMERCIAL AND SPECIAL BRONZES
NICKEL SILVER — BRASS — GILDING
INGOTS — SHEETS — RODS
WIRE — BLANKS — SPECIAL STAMPINGS

THE SEYMOUR MANUFACTURING CO.

SEYMOUR, CONN.

Established 1878

N. Y. SALES OFFICE, WOOLWORTH BLDG., N. Y. CITY

Prime Remelted Spelter

No better grade is found than that which we are producing for our customers. It's the result of long experience and highest skill. Try it.

Yellow and Composition Ingots

We urge that you try us on your next purchase. If we can please and meet the requirements of our other customers we can surely meet your demands.

Lehman Bros.

Smelters and Refiners

332 Jefferson St. Hoboken

NICKELOID in Sheets

and

RIBBONOID in Coils

In other words, we can furnish you with NICKELIZED ZINC in any form it is possible to make it at the present time.

Write us for Samples and Prices

American Nickeloid Co.

PERU, ILL.

Eastern Sales Agents,
Firm of R. Rothschild,
207 Norman Ave.,
Brooklyn, N Y.

The FIRST and LARGEST Mill in America to manufacture NICKELIZED ZINC.

NEW ENGLAND BRASS CO.

Manufacturers of

High-Grade Sheet Metals

in BRASS, BRONZE, GILDING and NICKEL SILVER

Also Special Nickel Alloys for the Jewelry Trade

OFFICE AND MILLS: TAUNTON, MASSACHUSETTS

Michigan Smelting & Refining Company

Detroit, Michigan, U. S. A.

M S R TRADE MARK MADE IN DETROIT METALS

A highly developed scientific and technical industry for the production, reclamation, manufacture and sale of non-ferrous metals, specializing in the production of

Standard Ingot Brass and Bronze, Bearing Metals, Solders, Lead Pipe, Brazing Spelter, Die Castings, etc., etc.

Capacity 400 tons daily.

BOUND VOLUMES

of

THE METAL INDUSTRY

For 1923

READY IN JANUARY

Price $3.00 Including a Year's Subscription to The Metal Industry **$3.50**

THE METAL INDUSTRY

99 John Street New York

Rome Quality Copper is a pure copper, close-grained and free from defects—a copper that works well and takes a high polish.

Sheets are uniformly accurate in size and gauge; squares, rounds and ovals conform to specifications, are uniform in density and free from structural defects.

Specify Rome Quality and obtain a quality copper that can be incorporated in the finest articles of art or commerce with satisfaction to consumer and economy to manufacturer.

Branch Warehouse:
3649 S. Racine Ave., Chicago, Ill.

2206, P

ROME BRASS AND COPPER COMPANY - ROME, N.Y.

BRASS ROME COPPER

CONSISTENCY

For quality foundry operations metal must be consistent in analysis and physical features.

That is why so many quality foundries are using British Aluminium.

The British Aluminium Co., Ltd.
of London, England
165 Broadway — New York City
597 King St. W. Toronto

ESTABLISHED 1850

JOHN HASSALL, INC.
CLAY & OAKLAND STREETS
BROOKLYN, N. Y.

QUICK DELIVERIES

RIVETS
ESCUTCHEON PINS
SPECIAL WIRE NAILS
IN ALL METALS

NIAGARA FALLS SMELTING & REFINING CORP.

A Certificate of Analysis goes with every Ingot of

BRASS AND BRONZE INGOTS—SOLDER—BABBITT METALS—ALUMINUM INGOTS—SPECIAL ALLOYS

"Metals That Please—A Service That Satisfies"

NIAGARA FALLS SMELTING & REFINING CORP.
NIAGARA AND ALBANY STS., BUFFALO, N. Y.

W. H. KEMP CO.
PURE ALUMINUM

In sheets, rod, wire, ingots, tubing and rivets. Aluminum angle and moulding for automobile body work. Fluxless Aluminum solder. Aluminum foil rolled to 1/1000 of an inch in thickness.

Aluminum Leaf and chemically pure Aluminum Powder for decorative work.

165-167 Spring St. NEW YORK
N. W. Cor. West Broadway

THOMAS F. LUKENS
METAL COMPANY
Manufacturers of
Babbitt, Solder, Type Metals & Fluxes

LUCO

WIRE SOLDER

Can be furnished on short notice, ordinary quantities from stock, in sizes from No. 6 to No. 16 Stubs Wire gauge. Let us quote on your requirements, whether for 1 spool or larger quantities.

We also carry a full line of Bar Solder, Rosin Core solder, Soldering coppers and handles, Acid swabs, Buzzer Gas appliances, Soldering flux (liquid paste or salts), Sal-Ammoniac, brick form.

1107 Fairmount Ave. Philadelphia, Pa.

SILICON COPPER

QUALITY AND PRICE

THE ELECTRIC SMELTING & ALUMINUM CO., LOCKPORT, N. Y.

THAT SATISFY

MANGANESE COPPER

ALUMINUM
Rod—SHEET—Wire
Moulding, Bar, Rivets, Tubing, Ingot, Matting
Immediate Shipment from Stock
STRAHS ALUMINUM CO. 48 FRANKLIN ST. NEW YORK

Thwing PYROMETERS

DON'T TAKE CHANCES with YOUR CASTING!

Use THWING A5X outfit and pour brass, bronze and aluminum at correct temperatures.

THWING INSTRUMENT COMPANY
3365 Lancaster Ave., Philadelphia, U. S. A.
126

DIRECTORY

Professional

ASSAYERS
WEIGHERS
SAMPLERS

Lucius PITKIN Inc.
Consulting and Analytical Chemists
Metals, alloys, solders, solutions, plating problems—Scrap, drosses, residues, grindings, skimmings weighed and sampled at any refinery in New York, Philadelphia or Chicago districts.
Offices and Laboratories: 47 Fulton Street, New York City

NEW YORK TESTING LABORATORIES
Analyses—Physical Tests—Microscopical Examinations—Experts on Plating Solutions and in Foundry Practice—Assayers for Ricketts & Company, Inc.
74-80 WASHINGTON STREET, NEW YORK
Phone—Bowling Green 7016

DIRECTORY

Copper, Brass and Other Metal Rolling Mills

MANUFACTURERS OF PLATE, SHEET, ROD, WIRE, TUBE, INGOT, METAL GOODS

NON-CORROSIVE FINEST QUALITY

Copper and Yellow

(MUNTZ) METAL
NAVAL BRASS
NAVAL BRONZE
MANGANESE BRONZE
PLATES, SHEETS, BOLTS, BARS, RODS, NAILS, TACKS, ETC.

Taunton—New Bedford Copper Co.

NEW BEDFORD, MASS.

New York 35 Howard St. Boston 61 Batterymarch St.

Sheet Brass Brass Rod Brass Wire
Brazed Tubing
Extruded Metal Shapes

THE BRISTOL BRASS CORPORATION

BRISTOL - CONNECTICUT

Organized 1850

The National Brass and Copper Company

Manufacturers of
HIGH GRADE, CLEAN and BRIGHT SHEET, PLATE and ROLL

Copper

ALL GAUGES and FINISHES
ASK FOR PRICES
QUICK SHIPPERS

LISBON - - OHIO

"Bridgeport"

TRADE BRASS MARK

LEDRITE High Speed Tested **BRASS ROD**

Uniform—Free Cutting—Chamfered Ends
For further information write to nearest office

New York—Pershing Square Bldg. Tel. Vand. 3025
Chicago—Wrigley Bldg. Tel. Dearborn 8477
Philadelphia—North American Bldg. Tel. Walnut 0190
Detroit—Gen'l Motors Bldg. Tel. Market 2659

Executive Offices and Works—Bridgeport, Conn.

Rome Hollow Wire & Tube Company

Main Office and Mill,
ROME, N. Y.
Manufacturers of
SEAMLESS BRASS AND COPPER TUBING

Making a specialty of the smaller sizes and thin gauges

Standard Underground Cable Co.

Manufacturers of
Copper, Brass and Bronze Rods and Wires
Copper and Brass Tubes, Extruded Brass Shapes
Copper Clad Steel Wire
TRADE C.C.C. MARK
Bare and Insulated Electric Wires and Cables

Branch Offices
Boston Chicago New York Philadelphia Kansas City Washington
Pittsburgh Los Angeles Detroit St. Louis Atlanta San Francisco
Seattle

For Canada: Standard Underground Cable Co. of Canada, Limited, Hamilton, Ont.

Sheet Brass and Nickel Silver

THE

DUEBER

WATCH CASE MFG. CO.
CANTON, OHIO U. S. A.

Dallas Brass & Copper Co.

General Office—820 Orleans Street

Detroit CHICAGO Cleveland

SHEET—ROD—TUBE—COPPER ANODES—EYELETS

Lighting Fixtures and Parts, Stampings and Spinnings
Lock Seam Tubing made in Brass, Copper, Steel and Zinc

Manhattan Brass Company

332 East 28th St. NEW YORK CITY

Manufacturers of
BRASS AND BRONZE in Sheets, Rod, Wire, Tubes, Moldings, etc. METAL GOODS, made to order from Brass, Bronze and Copper.

Keep your name before the trade
ADVERTISE IN
The Metal Industry

Sterling **FIRELESS** Silver
SILVER SOLDERS
John J. Jackson Company
157 Astor Street Newark, N. J.

DIRECTORY

Copper, Brass and Other Metal Rolling Mills

MANUFACTURERS OF PLATE, SHEET, ROD, WIRE, TUBE, INGOT, METAL GOODS

HENDRICKS BROTHERS INC.

SHEET AND BAR COPPER

Copper Fire Box Plates—Stay Bolts, Braziers' Rivets

INGOT COPPER, BLOCK TIN
SLAB ZINC-LEAD-ANTIMONY
BISMUTH-AND-NICKEL

49 CLIFF STREET
NEW YORK

TIN & LEAD FOIL
BLOCK TIN, SHEET & PIPE
BRITANNIA SHEET & CASTING METAL
LEAD & COMPOSITION TUBING
MUSIC ENGRAVERS PLATES
INQUIRIES INVITED
Dept. "B"

Standard Rolling Mills, Inc.
363-65-67 Hudson Avenue
BROOKLYN, N. Y.

C. G. HUSSEY & CO.
PITTSBURGH, PA.

COPPER

Sheets, Rolls, Plates, Anodes, Nails, Spikes, Conductor Pipe, Eaves Trough, Elbows and Shoes, Boiler Tube Ferrules, Strainers, Mitres, Corrugated Gaskets, Rivets, Eaves Trough Hangers, Pipe Fixtures.

Warehouses:
504 W. 24TH ST., NEW YORK. 224 N. JEFFERSON ST., CHICAGO.

Brass, Bronze, Copper
in
Thin Gauges

The Baltimore Brass Co.
1201 Wicomico St. Baltimore, Md.

FLAT WIRE

Phosphor Bronze, Nickel Silver, Aluminum, Monel, Pure Nickel, Brass, Copper, Common Bronze

GILBY WIRE COMPANY
NEWARK, NEW JERSEY

For Space in this Directory address THE METAL INDUSTRY, 99 John Street, New York.

Metal Smelters, Refiners, Dealers

PRODUCERS, ALSO BUYERS AND SELLERS OF NEW AND OLD METALS

CAPPER PASS & SON, LTD.
BEDMINSTER SMELTING WORKS
BRISTOL, ENGLAND
Cable Address—Pass, Bristol
Are Buyers of
Ore, Mattes, Drosses or Residues
Containing Tin, Copper, Lead and Antimony
Send samples for analysis

RED and YELLOW INGOT BRASS

The Whipple & Choate Company
429 Iranistan Ave., Bridgeport, Conn.

Rare Metals and Minerals Bought and Sold for Cash

JOSEPH RADNAI
36 FULTON ST., New York

PLATINUM, OSMIRIDIUM, PALADIUM, SILVER, QUICKSILVER, AMALGAMS, BISMUTH, CADMIUM, MAGNESIUM, TUNGSTEN, MOLYBDENUM, SILICON, GALENA, PYRITE, ETC.

Advertise your products in THE METAL INDUSTRY

DIRECTORY

Metal Smelters, Refiners, Dealers

PRODUCERS, ALSO BUYERS AND SELLERS OF NEW AND OLD METALS—(Cont'd)

We Buy and sell **METALS**

In Sheets, Strips and Circles

We are headquarters for

Black Iron, Steel and Tin Plate

Write us your requirements and offers

METAL PURCHASING CO., 63 Reade St.
NEW YORK

BALBACH SMELTING & REFINING CO.
Works Newark, N. J. Offices { Newark, N. J. / 280 Broadway, New York.
BALBACH METALS CORPORATION
280 Broadway New York, N. Y.
Purchasers of
COPPER BEARING MATERIAL
A superior market offered for all kinds of Residue and Scrap Materials containing copper in any form
LEAD BEARING MATERIAL
Battery Plates, Sediment, Sulphates, Drosses, etc.

Established 1789
NATHAN TROTTER & CO.

Pig Tin	Ingot Aluminum	Ingot Copper
Pig Lead		Shot Nickel
Slab Zinc		Antimony

36 No. Front St.
PHILADELPHIA, PA.

SHEET ZINC
Prime Quality—Direct from Makers
C. W. LEAVITT & CO.
30 Church St. New York
We Also Solicit Your Orders for
Aluminum—Antimony—Magnesium—Tin
and other Metals.
Telephone - Cortlandt 4752

Nassau Smelting & Refining Works
607 West 29th St., New York
COPPER, SLAB ZINC, LEAD, TIN, ALUMINUM, NICKEL, ANTIMONY
Red and Yellow Composition Manganese-Bronze
Ingot Phosphor-Bronze
BABBITT and TYPE METALS, SOLDERS
PURCHASERS AND REFINERS OF
TIN DROSSES, SCRUFF, MATTE, LEAD and TYPE DROSSES, METALLIC OXIDE, RESIDUES
AND ALL COPPER BEARING MATERIALS

ESTABLISHED 1896 Phone GLENMORE 4400
Belmont Smelting and Refining Works, Inc.
Formerly V. HENNING & SONS
THE QUALITY HOUSE
Gen. Offices: 332 BELMONT AVE., BROOKLYN, N. Y.
(Plant Covers 31 City Lots)
Manufacturers of "HEN" BRAND
GUARANTEED INGOT BRASS (Red and Yellow)
PURE AND No. 12 INGOT ALUMINUM
Dealers in VIRGIN METALS AND SCRAP METALS

Lead and Zinc Smelters and Manufacturers

PRODUCERS OF PIG LEAD, SLAB ZINC, ZINC ROD, SHEET ZINC, ACIDS

Illinois Zinc Company
Peru, Illinois
Manufacturers of
SHEET and RIBBON ZINC
SLAB ZINC
CORRUGATED ZINC SHEETS
for Roofing

EASTERN SALES OFFICE
280 Broadway New York City
Telephones: Worth 1496-7

Matthiessen & Hegeler Zinc Co. LA SALLE, ILL.
Manufacturers of
Sheet Zinc, Ribbon Zinc in Coils
AND SULPHURIC ACID
Smelters of ZINC Choice Brass Special
Sheet Zinc for drawn, spun and stamped ware manufacturers' purposes.
Special sizes to order, in squares, oblongs and discs.
Also Etchers', Engravers', Lithographers', Washboard Manufacturers' and Card and Paper Makers' sheets.
ROLLED ZINC PLATES FOR BOILER AND OTHER PURPOSES
Eastern Office—111 Broadway, New York, N. Y. Telephone—Rector 5586

STRIP ZINC
For Drawing and Stamping
FUSE METAL
THE PLATT BROS. & CO.
WATERBURY, CONN.

Your Advertisement Here Would Be Seen by Thousands of Readers

Lead and Zinc Smelters and Manufacturers

PRODUCERS OF PIG LEAD, SLAB ZINC, ZINC ROD, SHEET ZINC, ACIDS—(Cont'd)

ANACONDA ELECTROLYTIC ZINC

99.9% PURE

Produced at the Great Falls, Montana refinery of Anaconda Copper Mining Co.

PIG LEAD

BRANDS

I. L. R. CO. E. M. CO.

Refined at Perth Amboy, New Jersey, and East Chicago, Indiana

Sales Agents

UNITED METALS SELLING CO.

25 BROADWAY NEW YORK

THE HEGELER ZINC COMPANY

DANVILLE, ILLINOIS

Smelters of

Slab Zinc

(Spelter)

Manufacturers of

Sulphuric Acid

Contract Workers—Plated Sheet Metals

CASTING, STAMPING, ETCHING, PLATING, POLISHING, SPECIALTIES, ETC.

Automobile Brand and "Quality" Die CASTINGS

CMF

"*Quality*" first, economy afterwards—but through the speedy efficiency of our plant we are constantly effecting economies.

Whether interested in our "Quality" Die-Castings or in our "Automobile Brand Castings" of Aluminum, Manganese Bronze, Red and Yellow Brass and Bearing Metals—

Let Us Estimate

LIGHT MFG. & FOUNDRY CO.

Pottstown, Pa., U.S.A.

DESIGNING

Plaster and Wax Modeling and Chasing.
Detail work, small size.
Architectural, Artistic, and Ornamental,
Metal master, and Stock Patterns.

GEO. A. SCHEHR

Sta. S., Drawer 1

Cincinnati, Ohio, U. S. A.

NATIONAL SHEET METAL COMPANY

Manufacturers of

NICOLENE, Brassene, Copperene and Bronzene Nickel Tin, Brass Tin, Bronze Tin, Copper Tin, Oxidized Copper Tin, Sheet Zinc, polished.

Large Saving to Manufacturers. Because plated sheets are much cheaper than solid brass or copper sheets, and no plating is required after the article is made up.

Prompt Deliveries

For further information address office, PERU, ILLINOIS

PLATING, POLISHING AND FINISHING

A completely equipped plant for plating and polishing offers real service.

Especially equipped to finish die castings and aluminum parts.

Send Samples if you desire quotations

INDIVIDUAL SERVICE CO., INC. - - - EASTON, PA.

BUSINESS WANTS

FOR SALE AND WANTED—EQUIPMENT, ETC.

Display Advertisements, One Column Wide, $3 per inch, Each Insertion.

Plating Generators and Motors

FOR SALE—Hansen & Van Winkle Motor Generator Set, 1200 ampere, 6 volt, 15 H. P. Roth Motor, spare generator armature.

Holtzer-Cabot Motor Generator Set, 1200 ampere, 10 volt, 20 H. P. motor.

Three World (Boissier) 1000 ampere Dynamos, 5-6 volts, for belt or motor drive.

One World (Boissier) 500 ampere 5-6 volt, 5 H.P., G. E. motor.

Connecticut motor generator, 2000 ampere, 6 volt Diehl motor.

All in good operative condition and low priced. Write for details.

CHAS. J. BOGUE ELECTRIC CO.
513 West 29th St., New York, N. Y.

Brass Goods Plant

FOR SALE—Well equipped small brass foundry on good corner lot with space for expansion in large Ohio Valley City. Established trade includes practically all worth while production accounts. Present owners must give all their attention to other branches of business. Excellent opportunity for manufacturer using brass castings. Outside industry can secure free taxes and capital from commercial bodies.
OHIO VALLEY,
Care THE METAL INDUSTRY.

Guiding and Polishing Machine

FOR SALE—1 Excelsior Automatic Grinding and Polishing Machine No. 27, complete with Exhaust Fan and Piping. Never used as it is not suited to our class of work. Will sell at 25% under market price.
PARAMOUNT TEXTILE MACHINERY CO.,
Kankakee, Ill.

Guaranteed Plating Equipment

Save part of the initial cost of plating and electrical equipment by using guaranteed rebuilt machines. Our rebuilt plating generators and motors are priced to save you money. Write for our Bulletin A-3.
THE FUERST-FRIEDMAN CO.
CLEVELAND - - - - - - - OHIO
Electrical Equipment bought, sold and exchanged.

Mechanical Expert

TOOLS DESIGNED, manufacturing processes simplified, products standardized, machine shops and drafting rooms systematized.
W.,
Room 812, 145 West 45th Street, New York City.

Ding's Separator

FOR SALE—No. 2 Magnetic Separator with Motor Generator Set as follows: A. C. Motor Type H. L. 3 phase, 60 cycle, 1,700 R. P. M., 1½ H.P. Amp. 2.2, Volts 440. D. C. Generator Type K ½, 1,720 R. P. M., Volts 110. Good condition. $550.00 f. o. b. cars.
WILCOX, CRITTENDEN & CO., INC.
Middletown, Conn.

Rolling Mill

WANTED—Rolling mill with rolls about 12 inches long by 8 inches wide, for britannia metal.
FLORENCE SILVER PLATE CO.,
408 S. Hanover Street,
Baltimore, Md.

Bending Machinery

WANTED—Machinery for bending light gauge brass tubing. Address:
SUNSET PLATING AND MANUFACTURING CO.,
334 Clementine St.,
San Francisco, Cal.

INQUIRIES AND OPPORTUNITIES

For further particulars address THE METAL INDUSTRY

Inquiry 3133—Wire us names of firms that manufacture hydraulic or power machines for bending light gauge brass tubing such as basin traps.

Inquiry 3134—Please put me in touch with firms that manufacture good aluminum solder which can be used with the ordinary copper bit.

Inquiry 3135—Kindly have two or three of your clients quote us price and delivery on nickel anodes 95 to 99% pure.

Inquiry 3136—Kindly give us addresses of firms from whom we can secure knife, fork and spoon blanks ready for plating.

Inquiry 3137—Where can I get molds for die casting brass?

Inquiry 3138—Who makes "Kleanrite" for removing scale and rust from iron and steel?

Inquiry 3139—Please refer me to someone who can make a metal mold for casting small novelties in lead, chocolate or white lead.

SITUATIONS OPEN

Display Advertisements, One Column Wide, $3 Per Inch, Each Insertion

SALESMAN

SITUATION OPEN—Store salesman for metal department in a large hardware establishment. State age and experience.
HAMMACHER, SCHLEMMER & CO.,
133 4th Avenue, New York City.

Brass Foundry Foreman

SITUATION OPEN—For a jobbing brass and aluminum foundry in Southeastern Ohio. State age, experience and salary desired.
K. O. V.,
Care THE METAL INDUSTRY.

METALLURGIST

SITUATION OPEN—Man with brass foundry experience in capacity of Metallurgist, thorough knowledge of metal mixtures and working results. Apply with reference, giving age and family.
HAYS MANUFACTURING CO.,
Erie, Pa.

PLATER

SITUATION OPEN—We desire to get in touch with an A-1 man who is capable of taking entire charge of our plating department. Address:
SAFETY,
Care THE METAL INDUSTRY.

BUSINESS WANTS—Continued

SITUATIONS OPEN—Continued

Display Advertisements, One Column Wide, $3 Per Inch, Each Insertion.

Salesman to Sell Sawdust

WANTED—Salesman or plating supply houses to sell sawdust, which is used extensively for plating, polishing and drying purposes in the brass, copper and metal industries.

NATIONAL SAWDUST CO.,
102 North 1st Street, Brooklyn, N. Y.

Superintendent

SITUATION OPEN—Superintendent for plant in middle west. Experienced in smelting and refining secondary metals, ingot brass, white metals, also aluminum. Laboratory experience desirable.

MIDDLE WEST,
Care THE METAL INDUSTRY.

Buff Expert

SITUATION WANTED—Experienced buff man, having several years' experience in managing buff plant, wishes to make a change. Has a thorough knowledge of the buff business. Understands handling different classes of labor and the keeping of production at its highest efficiency. Will go anywhere.

BUFF EXPERT,
Care THE METAL INDUSTRY.

SALESMAN

SITUATION OPEN—We have openings for first class live salesmen calling on the manufacturing metal trade and tool shops. This is a real opportunity which will greatly increase your earnings. For full particulars, call or write

ECONOMY PRODUCTS CO.,
50 Spring Street, Newark, N. J.

If you Need a Good Man an ad in The Metal Industry will get you one.

SITUATIONS WANTED

Display Advertisements, One Column Wide, $1 per inch, Each Insertion

Foundry Foreman-Metallurgist

SITUATION WANTED—Foundry foreman and Metallurgist, non-ferrous foundryman, wishes to make a change for very good reasons. Have 20 years of practical experience in the manufacture of small and medium sizes non-ferrous castings, for the past 14 years with one of the leading foundries in the east, having charge of foundry melting department and chemical Laboratory, manufacturing high grade Brass and Bronze castings, having charge also of the manufacture of a well known high grade Bearing Bronze, having the highest reputation. Have long experiences with large production and molding machines with unskilled labor and with both crucible and open flame furnaces melting up to 20,000 pounds per day. Can successfully make and cast all kinds of non-ferrous alloys from both prime and secondary metals, can make chemical analysis of your products and keep them up to any desired standard, and keep your foundry under chemical control, can handle classes of labor, train unskilled men and keep your foundry up to the highest efficiency. Seek permanent connection with a reliable concern.

Address Non-Ferrous,
Care of THE METAL INDUSTRY

SALESMAN

SITUATION WANTED—Salesman of executive ability and practical manufacturing experience, with established headquarters in this city, desires to represent a reputable manufacturing concern desiring to expand. American.

EXECUTIVE,
Care THE METAL INDUSTRY.

SUPERINTENDENT

SITUATION WANTED—The advertiser has years of successful experience in overcoming the difficulties of non-ferrous plants; building up production and loyal operators. Open for permanent or temporary position as superintendent.

G. T. B.,
Care THE METAL INDUSTRY.

MANAGER SUPERINTENDENT

SITUATION WANTED—Metallurgical and Chemical Engineer, age 39, whose experience covers the electro-plating, steel and non-ferrous metal fields, is interested in forming new connections. Plant requiring a high grade engineering executive with business and organizing, as well as technical ability, would be interested in this advertisement. Address

C. H. A.,
Care THE METAL INDUSTRY

Brass Foundry Foreman and Metallurgist

SITUATION WANTED—Who can run your foundry efficiently and keep your products under chemical control. Who knows how to treat men so that they respect him and can get out production.

Twenty years of practical experience with small and medium size castings, large production on molding machines, with both crucible and open flame furnaces. Expert on melting and casting non-ferrous metals.

At present supervising Foundry, Melting department, and Chemical laboratory, of a well known eastern manufacturer of high grade bearing bronzes, etc.

Have been with this concern fourteen years, and for good reasons wish to make a change.

If you are in need of a real foundryman to run your foundry who has had a real practical experience, in all departments of the brass-foundry, and can keep your castings and your metals right, and control them under chemical supervision, and can afford to invest $300.00 per month for his services, let's get together.

BRONZE-FOUNDRY, Care THE METAL INDUSTRY.

SUPERINTENDENT

SITUATION WANTED—By responsible man now employed. Thoroughly familiar with brass, aluminum and nickel alloy casting. Can increase your production and maintain it. Capable of estimating costs and meeting competitors' quotations, also competent to supervise machine and polishing room in conjunction with foundry. Address:

T. N.,
Care THE METAL INDUSTRY.

BUSINESS WANTS—Continued

SITUATIONS WANTED—Continued

Display Advertisements, One Column Wide $1 Per Inch, Each Insertion

FOREMAN PLATER

SITUATION WANTED—Manufacturer desiring the services of an electro-plater should correspond with the writer, who has had a broad experience as foreman executive; familiar with all branches of the trade, efficient in handling help, controlling plating solutions economically and efficiently, and in securing quality production.

Plating experience includes the deposition of all of the well known metals; including their polishing and buffing, lacquering and enameling. Will furnish A-1 references as to character and ability. At present employed. Address,

Foreman, Care of The Metal Industry

Foreman Plater

SITUATION WANTED—As Foreman of plating, polishing, lacquering; experienced on auto parts, builders' hardware, silver ware, steel stampings, vanity boxes and electric light fixtures in all plate, oxidize and lacquer finishes. Job shop or factory. Will go anywhere.

T. B.,
Care THE METAL INDUSTRY.

ELECTRO-PLATERS

Anyone desiring the services of first class men for the electro-deposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the American Electro-Platers' Society.

FRANK J. HANLON,
2921 George St., Chicago, Ill.

Brass Foundryman

SITUATION WANTED—Brass Foundryman, at present employed, desires a position in charge of foundry making plumbers' supplies and valves or jobbing work. Have thorough knowledge of mixing of metals and general foundry practice. Capable of taking entire charge of foundry and producing high grade castings. Has held positions in charge for the past 12 years and has excellent record. American, age 40, married. RESULTS, Care THE METAL INDUSTRY.

Foreman Plater

SITUATION WANTED—Foreman of Polishing, Plating and Buffing Department. Has had 25 years' experience on all metals and in large shops. Best of references. Address:

H. S.,
Care THE METAL INDUSTRY.

Foreman Plater

SITUATION WANTED—Foreman Plater with 23 years' experience on all classes of work and solutions. Would like to connect with some reliable firm where the services of a first-class man are required. Address:

P. H.,
Care THE METAL INDUSTRY.

Foreman Plater

SITUATION WANTED—By expert plater who has specialized in all finishes used on gas and electric fixtures. Address:

ELECTRIC FIXTURES,
Care THE METAL INDUSTRY.

Foreman Plater

SITUATION WANTED—By a foreman plater, who has had many years' experience on all kinds of work and all finishes, including polishing, lacquering, spraying, etc. Can furnish the best of reference. Address:

R. V. A.,
Care THE METAL INDUSTRY.

CHICAGO BANQUET

The Chicago Branch of the American Electro-Platers' Society will hold its next Annual Banquet on Friday Evening, January 25th, 1924, at the Chicago Elks' Club, 174 W. Washington St., Chicago, Illinois.

We invite all concerns doing electroplating to send their foremen or any other representative. We will have an educational program in keeping with our previous affairs, also high class entertainment.

Price $2.50 per plate.

We are also arranging a theatre party for visiting ladies on the evening of the banquet.

Those wishing to make reservations, please write

R. J. HAZUCHA, Secretary
5128 Warwick Avenue **Chicago, Ill.**

A NEW BOOK

PRACTICAL ELECTRO-PLATING
FIFTH EDITION

Completely revised and greatly enlarged
BY W. L. D. BEDELL

A guide for the electro-plater and polisher, giving complete instructions for the arrangement of the shop, the installation of the plant, polishing, electro-plating, buffing, and lacquering.

PRACTICAL ELECTRO-PLATING
Fifth Edition
407 *Pages* ..... 140 *Illustrations*

Bound in Brown Silk Cloth, Size 5½ x 7¾ inches
Arranged in Sections, Concise and to the point
Written in plain shop language.
No confusing technical terms.

THE BOOK ILLUSTRATES

and describes the necessary articles, states what they are used for, and the methods of using them.

THE ARRANGEMENT

and classification differs entirely from any work previously published on this subject. It first describes the general shop arrangement then beginning with the installation of the dynamo, goes through the complete electrical equipment in the order in which it should be set up and connected, following with other necessary equipment and information in regular order. This feature will be found of particular advantage to the beginner.

The book also contains much information that will be of great value to even the old, experienced electro-platter.

OUR TWENTY-FIRST YEAR

Annual Review Number

will be issued in

JANUARY, 1924

THE METAL INDUSTRY is the best publication in which to advertise Metals, Machinery and Supplies that are suitable for the Metal and Plating Shops.

The Annual Review Number will be the best number of the year in which to begin advertising or to enlarge your present space.

THE METAL INDUSTRY
99 JOHN STREET
NEW YORK

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

ABRASIVES (Also see Emery.)

Artificial

Abrasive Company, Bridesburg, Philadelphia, Pa.
General Abrasive Co., Niagara Falls, N. Y.
Stevens, Frederic B., Detroit, Mich.

ACID-PROOF STONEWARE (See Acid pumps; Dipping Baskets.)

ACID PUMPS, STONEWARE

General Ceramics Co., New York.

ACIDS

Hydrofluoric

General Chemical Co., Philadelphia, Pa.

Oil of Vitriol (Sulphuric.)

Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Hegeler Zinc Co., Danville, Ill.
New Jersey Zinc Co., New York.

ACCUMULATORS, HYDRAULIC (Also see Hydraulic Machinery.)

Watson-Stillman Co., New York.

AEROPLANE DOPE

Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Nikolas, G. J., Co., Chicago, Ill.

AIR AND VARNISH HEATERS

Eureka Pneumatic Spray Co., Richmond Hill, N. Y.

AIR BRUSHES AND ACCESSORIES (See Sprayers; Spraying Accessories.)

AIR COMPRESSORS

DeVilbiss Mfg. Co., Toledo, O.
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.
Ideal Air Brush Mfg. Co., New York
Nikolas, G. J., Co., Chicago, Ill.

AIR FILTERS

De Vilbiss Mfg. Co., Toledo, Ohio.
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.
Nikolas, G. J., Co., Chicago, Ill.

AIR SCRUBBERS

Eureka Pneumatic Spray Co., Richmond Hill, N. Y.

AIR TANKS

Eureka Pneumatic Spray Co., Richmond Hill N. Y.
Nikolas, G. J., Co., Chicago, Ill.

AIR AND GAS PRE-MIXING BURNERS (See Burners.)

ALLOYS (See also Kind Wanted.)

Non-Ferrous

American Brass Co., Waterbury, Conn.

Brass, Bronze, Nickel, Silver

American Brass Co., Waterbury, Conn.

ALUMINUM (See Ingots, Sheet, Wire, Rod etc.)

ALUMINUM ALLOYS

American Boron Products Co., Reading, Pa.

AMMETERS (See also Electrical Apparatus and Equipment.)

Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.

AMMONIUM CHLORIDE (Sal Ammoniac.)

Roessler & Hasslacher Chemical Co., New York.

AMYL ACETATE

Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Nikolas, G. J., Co., Chicago, Ill.

ANNEALING FURNACES

Electric

Detroit Electric Furnace Co., Detroit, Mich.
Rockwell, W. S., Company, New York.

Oil or Gas

Best, W. N., Corp., New York.
Kenworthy, Chas. F., Waterbury, Conn.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell, W. S., Company, New York.
Surface Combustion Co., New York.

ANODES

Brass and Bronze

Connecticut Brass Foundry Co., Waterbury, Conn.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Krigner Tripoli Co., Detroit, Mich.
Lasalco, Inc., St. Louis, Mo.
Munning, A. P., & Co., New York-Chicago.
Stevens, Frederic B., Detroit, Mich.
Seymour Mfg. Co., Seymour, Conn.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y
Vay, John J., Company, Cleveland, Ohio.

Copper

Connecticut Brass Foundry Co., Waterbury, Conn.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Hussey, C. G., & Co., Pittsburgh, Pa.
Krigner Tripoli Co., Detroit, Mich.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York-Chicago.
Stevens, F. B., Detroit, Mich.
Seymour Mfg. Co., Seymour, Conn.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Gold

Handy & Harman, New York.

Nickel

Connecticut Brass Foundry Co., Waterbury, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Krigner Tripoli Co., Detroit, Mich.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York-Chicago.
Seymour Mfg. Co., Seymour, Conn.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Vay, John J., Company, Cleveland, Ohio.
Wiarda, John C., & Co., Brooklyn, N. Y.

Platinum

Handy & Harman, New York
Roessler & Hasslacher Chemical Co., New York.

Silver

Handy & Harman, New York.
Jackson, John J., Co., Newark, N. J.

Zinc

Connecticut Brass Foundry Co., Waterbury, Conn.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Krigner Tripoli Co., Detroit, Mich.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York-Chicago.
New Jersey Zinc Co., New York.

ANTI-FRICTION METAL (See also Babbitt Metal, and Bearings.)

Ajax Metal Company, Philadelphia, Pa.

ANTIMONY METAL

Leavitt, C. W., & Co., New York

ASSAY CRUCIBLES

Sand

Joseph Dixon Crucible Company, Jersey City, N. J

ASSAYERS, AND CHEMISTS (See also Testing Laboratories.)

New York Testing Laboratories, New York.
Pitkin, Lucius, Inc., New York.

AUTOMATIC MACHINERY (See Kind Wanted.)

AUTOMATIC POLISHING MACHINES

Excelsior Tool & Machine Co., E. St. Louis, Ill.

AUTOMATIC WIRE AND SHEET METAL WORKING MACHINERY

Baird Machine Co., Bridgeport, Conn.

AUTOMOBILE FORGINGS

Scovill Mfg. Co., Waterbury, Conn.

BABBITT METAL (See also Bearings.)

Ajax Metal Co., Philadelphia, Pa.
Electric Smelting & Aluminum Co., Lockport, N. Y.
Lukens, Thos. F., Metal Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

BABBITT MOLDS (See Molds.)

BALL BURNISHING EQUIPMENT (Also see Burnishing and Polishing Barrels.)

Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
No-Dust Drying Machine Co., Providence, R. I.

BALLS, STEEL (See Steel Balls.)

BARS; SILVER, GOLD, PLATINUM

Handy & Harman, New York.

BEARINGS (Also see Babbitt Metal and Anti-Friction Metal.)

Babbitt

Ajax Metal Co., Philadelphia, Pa.

Bronze

American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.

BINS AND RACKS, STEEL

Lupton's, David, Sons Co., Philadelphia, Pa.

BLAST GATES

Grand Rapids Blow Pipe & Dust Rrrester Co., Grand Rapids, Mich.

BLOWERS AND BLOW PIPING (See also Exhaust Fans and Heads.)

Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Monarch Engineering & Mfg. Co., Baltimore, Md.

BLOWERS, HIGH PRESSURE

Leiman Bros., New York.

BOILER INSULATION (See Brick, Insulating; Insulating Cement.)

BOILER SETTING (See Fire Cement.)

BOILERS, WATER TUBE

Babcock & Wilcox Co., New York.

BOLT, SCREW AND NUT MACHINERY

Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

BORONIC ALLOYS

American Boron Products Co., Reading, Pa.

BOTTOM PLATES, STEEL

Wadsworth Core Machine & Equipment Co., Akron, Ohio.

BRASS (See Brass Mill Products; Wire Mill Products; Anodes; Castings; Die Castings; Forgings; Ingots; Rods and Bars; Sheets; Strip Metal; Tubes; Wire.)

BRASS FOUNDERS (See Castings.)

BRASS FOUNDRY EQUIPMENT & SUPPLIES (See Kind Wanted.)

BRASS MILL ENGINEERS (See Engineers.)

BRASS MILL MACHINERY (Also See Kind Wanted.)

Blake & Johnson Company, Waterbury, Conn.
Mackintosh-Hemphill Co., Pittsburgh, Pa.

BRASS MILL PRODUCTS

Baltimore Brass Co., Baltimore, Md.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Western Cartridge Co., East Alton, Ill.

BRASS; SHEET, WIRE, ROD, TUBE (Also see Wire Mill Products; Rods and Bars; Sheets; Strip Metals; Tubes; Wire, Etc.)

American Brass Company, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Bristol Brass Co., Bristol, Conn.
Conklin, T. E., Brass & Copper Co., New York
Dallas Brass & Copper Co., Chicago, Ill.
Dueber Watch Case Mfg. Co., Canton, O.
Hendricks Bros., New York.
Manhattan Brass Co., New York.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Taunton-New Bedford Copper Co., Taunton, Mass.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

BRASS WORKING LATHES (See Lathes.)

BRICK (Also see Fire Brick.)

Cork Paving

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Insulating

Armstrong Cork & Insulation Co., Pittsburgh, Pa.

BRITANNIA METAL

Standard Rolling Mills, Inc., Brooklyn, N. Y.

BRONZE (See also Anodes; Castings; Forgings; Ingots; Powdered; Rods and Bars; Tubes, Etc.)

Bearing

American Brass Co., Waterbury, Conn.

Phosphor, Tobin, Manganese

American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Scovill Mfg. Co., Waterbury, Conn.

BRONZING LIQUID

Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

BRUSHES

Hand

Blumenthal, H., & Co., New York.
Munning, A. P., & Co., New York-Chicago.
Nikolas, G. J., Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.

Wheel

Blumenthal, H., & Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York-Chicago.

BUFFING CAKE, PLATINUM (See Buffing and Polishing Compositions.)

BUFFING AND POLISHING MACHINES (See Polishing and Buffing Machines.)

Cleveland Armature Wks., Cleveland, Ohio.

BUFFING MACHINES, AUTOMATIC (Also see Polishing Lathes and Heads.)

Divine Bros. Co., Utica, N. Y.

BUFFING AND POLISHING COMPOSITIONS

Bennett-O'Connell Co., Chicago, Ill.
Bruce Products Corp., Detroit, Mich.
Burns, E. Reed, Mfg. Corp., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Philadelphia, Pa.
Krigner Tripoli Co., Detroit, Mich.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.
Munning, A. P., & Co., New York-Chicago.
Oden Corp., Whitestone, L. I., N. Y.
Stevens, Frederic B., Detroit, Mich.
Vay, John J., Company, Cleveland, Ohio.

BUFFING AND POLISHING WHEELS (Also see Buffs.)

Canvas, Cotton, Etc.

Bennett-O'Connell Co., Chicago, Ill.
Bias Buff & Wheel Co., Jersey City, N. J.
Bruce Products Corp., Detroit, Mich.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Hanson & Van Winkle Co., Newark, N. J.
Lasalco, Inc., St. Louis, Mo.
Munning, A. P., & Co., New York-Chicago.
Vay, John J., Company, Cleveland, Ohio.

Felt

Bacon Felt Co., Winchester, Mass.
Bruce Products Corp., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Hanson & Van Winkle Co., Newark, N. J.

Sheepskin

Bruce Products Corp., Detroit, Mich.
Yorkville Mfg. Co., Brooklyn, N. Y.

BUFFS (Also see Buffing and Polishing Wheels.)

Bennett-O'Connell Co., Chicago, Ill.
Bias Buff & Wheel Co., Jersey City, N. J.
Bruce Products Corp., Detroit, Mich.
Burns, E. Reed, Mfg. Corp., Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York-Chicago.
Oden Corp., Whitestone, L. I., N. Y.
Vay, John J., Company, Cleveland, Ohio.

BUILDING PAINT SPRAYERS

DeVilbiss Mfg. Co., Toledo O.

BURNERS (Also see Furnaces.)

Air and Gas Pre-Mixing

Monarch Engineering & Mfg. Co., Baltimore, Md.

Oil or Gas

Best, W. N., Corp., New York.
Campbell Hausfeld Co., Harrison, Ohio.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.

BURNISHING AND POLISHING BARRELS

Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Globe Machine & Stamping Co., Cleveland, Ohio.
Henderson Bros. Co., Waterbury, Conn.
No-Dust Drying Machine Co., Providence, R. I.
Smith-Richardson Co., Attleboro, Mass.

BURNISHING COMPOUNDS AND CHIPS (Also see Soap.)

Abbott Ball Co., Hartford, Conn.
International Chemical Co., Philadelphia, Pa.

CANVAS WHEELS (See Buffing and Polishing Wheels.)

CARBONATE OF COPPER

Hardy, Charles, & Ruperti, Inc., New York.

CASTINGS

Aluminum

Light Mfg. & Foundry Co., Pottstown, Pa.
Scovill Mfg. Co., Waterbury, Conn.

Brass, Bronze and Composition

Ajax Metal Company, Philadelphia, Pa.
Connecticut Brass Foundry Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

Copper

Connecticut Brass Foundry Co., Waterbury, Conn.

Die

Light Mfg. & Foundry Co., Pottstown, Pa.

Nickel

Connecticut Brass Foundry Co., Waterbury, Conn.

Zinc

Connecticut Brass Foundry Co., Waterbury, Conn.
New Jersey Zinc Co., New York.

CAUSTIC SODA

Harshaw, Fuller & Goodwin Co., Philadelphia, Pa.
International Chemical Co., Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.
Solvay Process Co., Syracuse, N. Y.

CEMENT (See Fire Cement; Insulating Cement.)

CENTRIFUGAL DRYERS AND EXTRACTORS (Also see Drying-Out Machines.)

Tolhurst Machine Works, Troy, N. Y.

CHAIN GRATE STOKERS

Babcock & Wilcox Co., New York.

CHEMICALS, DEALERS IN ALL KINDS (Also see Kind Wanted.)

Bennett-O'Connell Co., Chicago, Ill.
Cooper, Charles, & Company, New York.
Harshaw, Fuller & Goodwin Co., Philadelphia, Pa.

CHEMISTS, CONSULTING (See Assayers and Chemists; Testing Laboratories.)

CHLORIDE OF IRON

Roessler & Hasslacher Chemical Co., New York.

CHUCKS

Spinning

Pryibil, P., Machine Co., New York.

Oval

Pryibil, P., Machine Co., New York.

CHROMIUM

Metal & Thermit Corp., New York.

CINDER CRUSHERS (See Crushers and Pulverizers; Reclaiming Machinery.)

CLEANERS, METAL, WASTE, GENERAL

Bruce Products Corp., Detroit, Mich.
Cowles Detergent Co., Lockport, N. Y.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
Greasalt Products Corporation, New York.
International Chemical Co., Philadelphia, Pa.
Oakley Chemical Co., New York.

CLEANING APPARATUS, AUTOMATIC METAL (Also see Pickling Machines.)

Crescent Washing Machine Co., New Rochelle, N. Y.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

CLEANING COMPOUNDS (See also Fig Cleanser; Pickling Compounds, Whale Oil Soaps.)

Metal

Anthony, H. M., Co., New York.
Bruce Products Corp., Detroit, Mich.
Cowles Detergent Co., Lockport, N. Y.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
Greasalt Products Corporation, New York.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Philadelphia, Pa.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Magnus Chemical Co., Brooklyn, N. Y.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.
Munning, A. P., & Co., New York-Chicago.
Oakley Chemical Co., New York.
Solvay Process Co., Syracuse, N. Y.
Stevens, Frederic B., Detroit, Mich.

COCK GRINDERS, AUTOMATIC

Turner Machine Co., Philadelphia, Pa.

COILERS, SHEET METAL

Blake & Johnson Company, Waterbury, Conn.

COMPOSITION METAL (See Castings; Ingot, Etc.)

COMPOSITIONS (See Buffing and Polishing Compositions; Flooring Compositions.)

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING

Bruce Products Corp., Detroit, Mich.
Greasalt Products Corporation, New York.
International Chemical Co., Philadelphia, Pa.
Oakley Chemical Co., New York.

COMPRESSORS, AIR & GAS (See Air Compressors.)

CONCENTRATING TABLES (See also Reclaiming Machinery.)

CONSULTING METALLURGIST

Krom, L. J., New York.

CONTRACT WORK (See Casting; Die-Castings; Dies; Electro-Galvanizing; Electro-Plating; Forgings; Hot Galvanizing and Tinning; Plating, Barrel Method; Polishing and Burnishing, Etc.)

COPPER (Also see Anodes; Castings; Ingots; Rods and Bars; Sheets; Smelters and Refiners; Strip Metal; Tubes; Wire, Etc.)

Sheet, Wire, Rod, Tube

American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.

COPPER-ALUMINUM, BORONIC

American Boron Products Co., Reading, Pa.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

COPPER BEARING MATERIAL, BUYERS OF (See Drosses, Residues, Etc.)

COPPER, BORONIC
American Boron Products Co., Reading, Pa.

COPPER, CARBONATE OF
Cooper, Chas., & Co., New York.
Crown Rheostat & Supply Co., Chicago, Ill.
Wiarda, John C., Co., Brooklyn, N. Y.

COPPER-CLAD WIRE, ROD, ETC. (See Wire.)

COPPER-CYANIDE
American Cyanamid Co., New York.
Hardy, Charles, & Ruperti, Inc., New York.
Kyle, Geo. W., Company, New York.
Roessler & Hasslacher Chemical Co., New York.

COPPER-NICKEL, BORONIC
American Boron Products Co., Reading, Pa.

COPPER SULPHATE
Hardy, Charles, & Ruperti, Inc., New York.

CORE MACHINES
Stevens, Frederic B., Detroit, Mich.
Wadsworth Core Machine & Equipment Co., Akron, Ohio.

CORE OIL AND COMPOUNDS
Buckeye Products Co., Cincinnati, Ohio.
Stevens, Frederic B., Detroit, Mich.

CORE OVEN INSULATION (See Brick, Insulating; Insulating Cement; Insulation Oven.)

CORE OVENS

Coal and Coke
Monarch Engineering & Mfg. Co., Baltimore, Md.
Steiner, E. E., & Co., Newark, N. J.
Stevens, Frederic B., Detroit, Mich.
Wadsworth Core Machine & Equipment Co., Akron, O.

Oil and Gas
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Wadsworth Core Machine & Equipment Co., Akron, O.

CORE SAND MIXERS
National Engineering Co., Chicago, Ill.

CORE TRAYS, STEEL
Wadsworth Core Machine & Equipment Co., Akron, O.

COUPLES
Dixon, Joseph, Crucible Co., Jersey City, N. J.

CRANES, HAND, POWER AND ELECTRIC TRAVELING
Northern Engineering Works, Detroit, Mich.

CRUCIBLES, METAL MELTING
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
Lava Crucible Co. of Pittsburgh, Pittsburgh, Pa.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Naugatuck Valley Crucible Co., Shelton, Conn.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Seidel, R. B., Inc., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Taylor, Robt. J., Inc., Philadelphia, Pa.

CRUCIBLE TONGS (See Tongs.)

CRUSHERS AND PULVERIZERS (See also Reclaiming Machinery.)
Mine & Smelter Supply Co., New York.
Standard Equipment Co., New Haven, Conn.

CUPRO-NICKEL (See Brass Mill Products.)

CUT-OFF GATES (Galvanized Steel)
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.

CUTTING, STRAIGHTENING & FORMING MACHINERY

Wire
Baird Machine Co., Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.

Strip Metal
Baird Machine Co., Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.

CYANIDE (See also Copper-Cyanide; Silver Cyanide; Sodium Cyanide; Zinc Cyanide.)
American Cyanamid Co., New York.
Buchanan, Thos., Co., Cincinnati, Ohio.
Crown Rheostat & Supply Co., Chicago, Ill.

DEOXIDIZERS, METAL (See Fluxes.)

DIE CASTING MACHINES

Soft Metal
Byrd, R. E., Erie, Pa.

DIE-CASTINGS

White Metal
Light Mfg. & Foundry Co., Pottstown, Pa.

DIES

Diamond, Wire
Vianney Wire Die Wks., New York.

DIPPING BASKETS

Automatic
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Stoneware
General Ceramics Co., New York.

DOORS AND PARTITIONS, STEEL
Lupton's, David, Sons Co., Philadelphia, Pa.

DRAW BENCHES

Wire, Rod, Tube
Watson-Stillman Co., New York.

Light Wire
Leiman Bros., New York.

DRAWING AND STAMPING (See Metal Goods Made to Order; Stamping and Drawing.)

DRILLING MACHINES

Light Sensitive
Leiman Bros., New York.

DRINKING WATER SUPPLY SYSTEMS
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

DROP LIFTERS (See also Presses, Drop Lifters for.)

Automatic
Miner & Peck Mfg. Co., Derby, Conn.

DROSSES, RESIDUES, ETC., BUYERS OF (Also see Metal Dealers, Old.)
Balbach Metals Corp., New York, N. Y.
Capper, Pass & Son, Ltd., Bristol, England.
Nassau Smelting & Refining Co., New York.

DRYERS (See Centrifugal Dryers; Ovens; Drying-Out Machines; Ladle Heaters and Dryers; Mold Dryers; and Dryers; Sawdust Drying-Out Boxes.)

DRYING-OUT MACHINES (See also Centrifugal Dryers and Extractors; Sawdust Drying-Out Boxes.)
Baird Machine Co., Bridgeport, Conn.
Smith-Richardson Co., Attleboro, Mass.

Automatic
Astle, H. J., & Co., Providence, R. I.
No-Dust Drying Machine Co., Providence, R. I.
Tolhurst Machine Works, Troy, N. Y.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

DUST COLLECTORS AND VENTILATING SYSTEMS (Also see Exhaust Fans and Heads.)
American Foundry Equipment Co., New York.
Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Kirk & Blum Mfg. Co., Cincinnati, O.
No-Dust Drying Machine Co., Providence, R. I.

DYNAMOS, LOW VOLTAGE, PLATING AND GALVANIZING (Also see Electrical Apparatus and Equipment.)
Bennett-O'Connell Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Jants & Leist Electric Co., Cincinnati, O.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill
Munning, A. P., & Co., New York-Chicago.
Stevens, Frederic B., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Vay, John J., Company, Cleveland, Ohio.

ELECTRICAL APPARATUS AND EQUIPMENT (Also see Ammeters, Rheostats, Switchboards, Transformers, Voltmeters.)
Bennett-O'Connell Co., Chicago, Ill.

ELECTRIC CRANES (See Cranes.)

ELECTRIC FURNACES

Annealing, Hardening, Etc.
Detroit Electric Furnace Co., Detroit, Mich.
Rockwell, W. S., Company, New York.

Laboratory
Detroit Electric Furnace Co., Detroit, Mich.

Melting
Ajax Metal Co., Philadelphia, Pa.
Detroit Electric Furnace Co., Detroit, Mich.
Wile Electric Furnace & Engineering Co., New York.

ELECTRIC HOISTS (See Hoists.)

ELECTRIC OVENS (See Ovens; also Core Ovens.)

ELECTRO-GALVANIZING, JOB AND CONTRACT
Brunell, A. A., Co., Worcester, Mass.
Hassall, John, Inc., Brooklyn, N. Y.
Sievering, Philip, New York.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO GALVANIZING EQUIPMENT AND SUPPLIES (See Dynamos; Plating Barrels; Plating Machines, Automatic; Tanks, etc.)

ELECTRO GALVANIZING MACHINES, AUTOMATIC (See Plating Machines, Automatic.)

ELECTRO PLATING, JOB & CONTRACT (Also see Polishing and Burnishing; Plating, Barrel Method.)
Boston Tumble Barrel Plating Works, Boston, Mass.
Hassall, John, Inc., Brooklyn, N. Y.
Individual Service Co., Inc., Easton, Pa.
Sievering, Philip, New York.

ELECTRO PLATING EQUIPMENT AND SUPPLIES (See Kind Wanted.)

EMERY (Also see Abrasives.)
Crown Rheostat & Supply Co., Chicago, Ill.
Krigner Tripoli Co., Detroit, Mich.
Matchless Metal Polish Co., Chicago, Ill.-Glen Ridge, N. J.
Stevens, Frederic B., Detroit, Mich.

ENAMELING OVENS (See Ovens.)

ENAMELS

Colored
Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Hilo Varnish Corp., Brooklyn, N. Y.
Kay and Ess Co., Dayton, Ohio.
Maas & Waldstein Co., New York.
Nikolas, G. J., & Co., Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

Lacquer
Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Hilo Varnish Corp., Brooklyn, N. Y.
Kay and Ess Co., Dayton, Ohio.
Maas & Waldstein Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Wood
Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Hilo Varnish Corp., Brooklyn, N. Y.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

ENAMEL SPRAYERS (See Sprayers.)

ENGINEERS

Furnace
Kenworthy, Chas. F., Waterbury, Conn.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell, W. S., Company, New York.

Polishing and Grinding
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Divine Bros. Co., Utica, N. Y.

ESCUTCHEON PINS, ALL METAL
Hassall, John, Inc., Brooklyn, N. Y.

ETHYL ACETATE
Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Nikolas, G. J., & Co., Chicago, Ill.

EXHAUST BOOTHS AND BENCHES FOR LACQUERING
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.

EXHAUST FANS AND HEADS (Also see Blowers and Blow Piping; Dust Collectors and Ventilating Systems.)
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.

EXHAUST WHEELS, ROLLER BEARING, BELT AND MOTOR DRIVEN
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.

EXTRUDED SHAPES
Brass, Copper and Bronze
Scovill Mfg. Co., Waterbury, Conn.

EYELET MACHINES
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

FACING SAND MIXERS
National Engineering Co., Chicago, Ill.

FACINGS (See Foundry Facings.)

FELT, POLISHING
American Felt Co., Boston, Mass.
Bacon Felt Company, Winchester, Mass.

FELT POLISHING WHEELS (Also see Buffing and Polishing Wheels.)
Bacon Felt Co., Winchester, Mass.
Bruce Products Corp., Detroit, Mich.
Crown Rheostat & Supply Co., Chicago, Ill.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.

FELT SHEETS
American Felt Co., Boston, Mass.
Bacon Felt Co., Winchester, Mass.
Bruce Products Corp., Detroit, Mich.
Eastern Felt Co., Winchester, Mass.

FERRULES, BRASS AND COPPER
American Brass Co., Waterbury, Conn.

FIG CLEANERS (Also see Cleaning Compounds, Whale Oil Soap.)
International Chemical Co., Philadelphia, Pa.

FILM COATINGS
Waukegan Chemical Co., Waukegan, Ill.

FIRE CEMENT
Buckeye Products Co., Cincinnati, Ohio.
Campbell-Hausfeld Co., Harrison, Ohio.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Keystone Refractories Co., New York.
Lava Crucible Co. of Pittsburgh, Pittsburgh, Pa
Mack Engineering & Supply Co., New York.
Quigley Furnace Specialties Co., New York.

FLOORING COMPOSITION
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

FLUXES
Metal Melting
American Boron Products Co., Reading, Pa.

Soldering and Tinning
Bruce Products Corp., Detroit, Mich.
Johnson Mfg. Co., Chicago, Ill.
Lukens, Thos. F., Metal Co., Philadelphia, Pa.
Superior Chemical & Mfg. Co., Aspinwall, Pa.

FORGINGS (Also see Automobile Forgings.)
Brass and Bronze
Scovill Mfg. Co., Waterbury, Conn.

FOUNDRY EQUIPMENT AND SUPPLIES (See Kind Wanted.)

FOUNDRY ENGINEERS (See Engineers.)

FOUNDRY FACINGS
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

FOUNDRY RIDDLES (See Sand Sifters.)

FOUNDRY SPRAYERS (See Sprayers.)

FURNACE CEMENT (See Fire Cement.)

FURNACE ENGINEERS (See Engineers.)

FURNACE INSULATION (See Brick, Insulating; Insulating Cement; Insulation, Furnace.)

FURNACES (See Annealing Furnaces; Burners; Electric Furnaces; Galvanizing & Tinning Furnaces; Heat Treating Furnaces; Melting Furnaces; Powdered Coal Burning Furnaces; Sherardizing Furnaces; Smelting Furnaces.)

FURNACE TILE AND LININGS (Also see Fire Brick.)
Monarch Engineering & Mfg. Co., Baltimore, Md.

FUSE METAL
Platt Bros. & Co., Waterbury, Conn.

FUSEL OIL
Nikolas, G. J., & Co., Chicago, Ill.

GALVANIZING (See also Electric Galvanizing, Job, and Contract; Hot Galvanizing, Job and Contract.)
New Jersey Zinc Co., New York.

GALVANIZING AND TINNING FURNACES (Also see Burners.)
Monarch Engineering & Mfg. Co., Baltimore, Md.

GALVANIZING EQUIPMENT AND SUPPLIES (See Kinds Wanted. Also Plating Galvanizing Machines, Automatic; Hot and Galvanizing Barrels; Plating and Galvanizing and Tinning Equipment.)

GAS APPLIANCES
Johnson Gas Appliance Co., Cedar Rapids, Iowa.

GAS BURNERS (See Burners.)

GATE CUTTERS (See Saws; Sprue Cutters.)

GENERATORS (See Dynamos; Motor-Generator Sets.)

GLUE FOR POLISHING
Divine Bros. Co., Utica, N. Y.

GLUE HEATERS AND POTS
Divine Bros. Co., Utica, N. Y.

GOLD (See Anodes; Bars; Metal Dealers; Smelters and Refiners.)

GOLD, BORONIC
American Boron Products Co., Reading, Pa.

GRAPHITE, IMPORTED
Pettinos, George F., Philadelphia, Pa.

GRAPHITE PRODUCTS, PHOSPHORIZERS STIRRERS, ETC. (Also see Crucibles.)
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa
Naugatuck Valley Crucible Co., Shelton, Conn.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Seidel, R. B., Inc., Philadelphia, Pa.
Taylor, Robt. J., Inc., Philadelphia, Pa.

GREASES, WIRE DRAWING
United States Wire Draw Grease Co., Elizabeth, N. J.

GRINDER, Machine Knife
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.

GRINDERS, SWINGING
Excelsior Tool & Machine Co., E. St. Louis, Ill.

GRINDING MACHINES
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Cleveland Armature Wks., Cleveland, Ohio.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Excelsior Tool & Machine Co., E. St. Louis, Ill.
Mitchell Engineering Co. of Springfield, Ohio.
Stevens, Frederic B., Detroit, Mich.

GRINDING PANS
National Engineering Co., Chicago, Ill.

GRINDING WHEEL HOODS (See Dust Collectors and Ventilating Systems; Hoods.)

HEAT TREATING FURNACES, ELECTRIC
Detroit Electric Furnace Co., Detroit, Mich.

HOISTS (Also see Cranes.)
Air, Chain, Electric, Pneumatic, Hydraulic
Northern Engineering Works, Detroit, Mich.

HOODS (Also see Dust Collectors and Ventilating Systems.)
Grinding Wheel
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.

Polishing and Grinding Wheel
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Spraying
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
De Vilbiss Mfg. Co., Toledo, Ohio.
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.

HOT GALVANIZING AND TINNING EQUIPMENT (See Burners; Galvanizing and Tinning Furnaces; Kettles; Tanks.)

HOT TINNING (See Hot Galvanizing and Tinning.)

HOT TINNING SUPPLIES (See Hot Galvanizing and Tinning Equipment.)

HYDRAULIC MACHINERY, PRESSES, JACKS, ETC. (Also see Accumulators; Presses.)
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Watson-Stillman Co., New York.

INGOT MOLDS (See Molds.)

INGOTS (Also see Calcium-Copper; Manganese-Copper; Phosphor-Copper; Phosphor-Tin; Silicon-Copper; Smelters and Refiners.)
Aluminum
Amalgamated Metals Selling Co., New York.
British Aluminum Co., New York and Toronto, Ontario.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

Brass, Bronze and Composition
Ajax Metal Company, Philadelphia, Pa.
Belmont Smelting & Refining Works, Brooklyn, N. Y.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.
Whipple & Choate Company, Bridgeport, Conn.

Copper
Balbach Metals Corp., New York, N. Y.
Hendricks Bros., New York.
Trotter, Nathan, & Co., Philadelphia, Pa.

Lead
United Metals Selling Co., New York.

Manganese-Bronze
Whipple & Choate Company, Bridgeport, Conn.

Silver
Handy & Harman, New York.

Tin
Ajax Metal Co., Philadelphia, Pa.

White Metals
Michigan Smelting & Refining Co., Detroit, Mich.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

INSULATING BRICK, BLOCK, POWDER AND CEMENT (See also Brick.)
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

INSULATING CEMENT, HEAT
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Mack Engineering & Supply Co., New York.

INSULATION (Also see Brick, Insulating; Insulating Cement.)
Boiler
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Quigley Furnace Specialties Co., New York.
Oven
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Quigley Furnace Specialties Co., New York.
Furnace
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Mack Engineering & Supply Co., New York.
Quigley Furnace Specialties Co., New York.
Pipe
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

IRON CASTINGS (See Castings.)

JAPAN REMOVERS
Bruce Products Corp., Detroit, Mich.
International Chemical Co., Philadelphia, Pa.

JAPANS, ALL KINDS
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Hilo Varnish Corp., Brooklyn, N. Y.

JAPANNING BARRELS (See Tumbling Barrels.)

JAPANNING OVENS (See Ovens.)

JEWELERS' BRUSHES (See Brushes.)

JEWELERS' EQUIPMENT (Also see Kind Wanted.)
Leiman Bros., New York.
Smith-Richardson Co., Attleboro, Mass.

JEWELERS' ROLLS (See Rolls.)

JEWELERS' SOLDER (See Solders.)

JIGS, FIXTURES, ETC. (See Tools, Jigs, Fixtures.)

LABORATORIES (See Testing Laboratories.)

LACQUERING BARRELS (See Tumbling Barrels.)

LACQUERING, JOB AND CONTRACT
Brunell, A. A., Co., Worcester, Mass.
Sievering, Philip, New York.

LACQUER ENAMELS (See Enamels.)

LACQUER OVENS (See Ovens.)

LACQUERS
Colored
Celluloid Zapon Company, New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Hilo Varnish Corp., Brooklyn, N. Y.
Maas & Waldstein Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.
For Incandescent Lamps
Egyptian Lacquer Mfg., Co., New York.
Metal
Celluloid Zapon Company, New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Maas & Waldstein Co., New York.
Nikolas, G. J., Co., Chicago, Ill.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.
Wood
Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Waukegan Chemical Co., Waukegan, Ill.
Zeller Lacquer Mfg. Co., New York.

LACQUER REMOVERS
Egyptian Lacquer Mfg., Co., New York.
International Chemical Co., Philadelphia, Pa.

LACQUER SPRAYERS (See Sprayers.)

LADLE HEATERS AND DRYERS
Hawley Down-Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.

LATHES (See also Polishing Lathes.)
Metal Spinning and Wood Turning
Fruin, Thomas, Machine Co., New York.
Pryibil, P., Machine Co., New York.

LEAD BURNING
Abernethy, John F., Brooklyn, N. Y.

LEAD-LINED TANKS (See Tanks.)

LEATHER POLISHING WHEELS (See also Buffing and Polishing Wheels.)
Yorkville Mfg. Co., Brooklyn, N. Y.

LEATHER (DRY BARREL-TUMBLING)
Yorkville Mfg. Co., Brooklyn, N. Y.

LOCOMOTIVES, INDUSTRIAL (See Electric Locomotives.)

LUBRICANTS, Cutting and Grinding, Drawing, Stamping
International Chemical Co., Philadelphia, Pa.
Oakley Chemical Co., New York.

MAGNESIUM METAL
Sheet, Wire, Rod, Ribbon, Powder
Amalgamated Metals Selling Co., New York.
Leavitt, C. W., & Co., New York.
Norton Laboratories, Lockport, N. Y.

MAGNETIC SEPARATORS (See also Reclaiming Machinery.)
Magnetic Mfg. Company, Milwaukee, Wis.
Paxson, J. W., Co., Philadelphia, Pa.
Rome Mfg. Co., Rome, N. Y.

MANGANESE
Metal & Thermit Corp., New York.

MANGANESE-BRONZE (See Ingots.)

MANGANESE-COPPER (Also see Ingots.)
Ajax Metal Company, Philadelphia, Pa.
Electric Smelting & Aluminum Co., Lockport, N. Y.
Metal & Thermit Corp., New York.

MANTLE DIP
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Nikolas, G. J., Co., Chicago, Ill.

MELTING FURNACES (Also see Burners; Galvanizing and Tinning Furnaces; Tank Furnaces.)
Brass
Detroit Electric Furnace Co., Detroit, Mich.
Coal and Coke
Monarch Engineering & Mfg. Co., Baltimore, Md.
Electric
Detroit Electric Furnace Co., Detroit, Mich.
Oil or Gas
Buckeye Products Co., Cincinnati, Ohio.
Campbell-Hausfeld Co., Harrison, Ohio.
Hawley Down-Draft Furnace Co., Easton, Pa.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Kenworthy, Chas. F., Inc., Waterbury, Conn.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Pit
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Reverberatory
Hawley Down-Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.

METAL BRIQUETTES (See Briquet-Ingots.)

METAL CLEANERS (See also Cleaning Compounds.)
Bruce Products Corp., Detroit, Mich.
Cowles Detergent Co., Lockport, N. Y.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
Greasalt Products Corp., New York.
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Brooklyn, N. Y.
Oakley Chemical Co., New York.
Solvay Process Co., Syracuse, N. Y.

METAL DEALERS (Also see Drosses, Residues, Etc., Buyers of; Turnings, Chips, Etc., Buyers of.)
Gold, Silver, Platinum
Radnai, Josef, New York.
Roesaler & Hasslacher Chemical Co., New York.
New Metals
Nassau Smelting & Refining Co., New York.
Trotter, Nathan, & Co., Philadelphia, Pa.
Old Metals
Belmont Smelting & Refining Works, Inc., Brooklyn, N. Y.
Metal Purchasing Co., New York.
Rare Metals
Radnai, Josef, New York.
Zinc
New Jersey Zinc Co., New York.

METAL DRYERS, CENTRIFUGAL
Tolhurst Machine Works, Troy, N. Y.

METAL GOODS MADE TO ORDER (Also see Stamping and Drawing.)
Kenworthy, Charles F., Inc., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Western Cartridge Co., East Alton, Ill.

METAL PARTS WASHING MACHINE
Crescent Washing Machine Co., New Rochelle, N. Y.

METAL POLISH
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.

METAL RECLAIMING EQUIPMENT (See Concentrating Tables; Crushers and Pulverizers; Magnetic Separators.)

METALS (See also Kinds Wanted. Also Metal Dealers.)
Bearing
American Brass Co., Waterbury, Conn.
Extruded and Die Pressed
American Brass Co., Waterbury, Conn.

METALS, PLATED SHEET (See Plated and Polished Sheet Metals; Sheets.)

METALS, RARE (See Metal Dealers.)

MILLS, CRUSHING (See Crushers and Pulverizers.)

MILLS, PAN
National Engineering Co., Chicago, Ill.

MIXERS, SAND
National Engineering Co., Chicago, Ill.

MODELING AND CHASING, Plaster and Wax
Schehr, Geo. A., Cincinnati, O.

MOLD DRYERS, PORTABLE
Monarch Engineering & Mfg. Co., Baltimore, Md.

MOLDING MACHINES
Hand Operated
Turner Machine Co., Philadelphia, Pa.
Power
American Foundry Equipment Co., New York.
Turner Machine Co., Philadelphia, Pa.

MOLDING SAND (See Sand.)

MOLDS
Babbitt and Solder
Fanning, J. P., Co., Brooklyn, N. Y.
Schweizer, Chas. K., St. Louis, Mo.
Ingot
Fanning, J. P., Co., Brooklyn, N. Y.
Schweizer, Chas. K., St. Louis, Mo.

MOLD SPRAYERS (See Sprayers.)

MOTOR CONTROL EQUIPMENT (See Electrical Apparatus and Equipment.)

MOTORS (Also see Electric Apparatus and Equipment.)

MOTOR-GENERATOR SETS (Also see Dynamos; Electrical Apparatus and Equipment.)
Bennett-O'Connell Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Jantz & Leist Electric Co., Cincinnati, Ohio.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York-Chicago.
Vay, John J., Company, Cleveland, Ohio.

MUFFLES
Dixon, Joseph, Crucible Co., Jersey City, N. J.

MUNTZ METAL (See Sheets.)

NICHROME HEAT RESISTING ALLOYS (See Castings; Dipping Baskets, Wire.)

NICKEL (See Anodes; Castings; Sheets; Wire; Etc.)

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

NICKEL BORONIC
American Boron Products Co., Reading, Pa.

NICKEL SALTS
Buchanan, Thos., Co., Cincinnati, Ohio.
Cooper, Chas., & Co., New York.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, Ohio.
Krigner Tripoli Co., Detroit, Mich.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York-Chicago.
Roessler & Hasslacher Chemical Co., New York.
Stevens, Frederic B., Detroit, Mich.
Wiarda, John C., & Co., Brooklyn, N. Y.

NICKEL SHOT
Seymour Mfg. Co., Seymour, Conn.

NICKEL SILVER (See also Brass, Sheets, Wire, Rod, Tube, Castings; Forgings; Sheets; Etc.)

Sheet, Wire, Rod, Tube
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

NICKEL SULPHATE, SINGLE AND DOUBLE
Hardy, Charles, & Ruperti, Inc., New York.

OIL OF VITRIOL
Wiarda, John C., & Co., Brooklyn, N. Y.

OIL BURNERS (See Burners.)

OIL PUMPS (See Oil Storage Systems.)

OIL STORAGE AND PUMPING SYSTEMS
Monarch Engineering & Mfg. Co., Baltimore, Md.

OLD METALS (See Drosses, Residues, Etc., Buyers of; Metal Dealers.)

OVENS (Also see Burners; also Core Ovens.)

Enameling, Lacquering, Japanning
Steiner, E. E., & Co., Newark, N. J.

OVEN BURNERS (See Burners.)

OVEN INSULATION (See Brick, Insulating; Insulating Cement; Insulation.)

OXIDIZING SOLUTIONS
Buchanan, C. G., Chemical Co., Cincinnati, Ohio.
Sulphur Products Co., Greensburg, Pa.

PAINT SPRAYERS (See Sprayers.)

PARKERIZING
Parker Rust Proof Co., Detroit, Mich.

PARTING COMPOUNDS
Buckeye Products Co., Cincinnati, Ohio.

PATTERN SHOP EQUIPMENT (See Lathes; Saws.)

PAVING BRICK, CORK (See Brick.)

PHOSPHOR BRONZE (See also Ingots.)
Ajax Metal Company, Philadelphia, Pa.

PHOSPHORIZERS (See Graphite Products.)

PHOSPHOR-COPPER (Also see Ingots.)
Ajax Metal Company, Philadelphia, Pa.
Electric Smelting & Aluminum Co., Lockport, N. Y.

PHOSPHOR-COPPER, BORONIC
American Boron Products Co., Reading, Pa.

PHOSPHOR-TIN (See also Ingots.)
Ajax Metal Company, Philadelphia, Pa.

PHOSPHOR-TIN, BORONIC
American Boron Products Co., Reading, Pa.

PHOSPHORUS
General Chemical Co., Philadelphia, Pa.

PICKLING COMPOUND (See Cleaning Compounds.)

PICKLING MACHINES, AUTOMATIC
No-Dust Drying Machine Co., Providence, R. I.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PIPE, BRASS AND COPPER
American Brass Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

PIPE AND BOILER COVERINGS, STEAM, ICE WATER, BRINE (See also Insulation.)
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

PLATED AND POLISHED SHEET METALS (See also Sheets.)
American Nickeloid Co., Peru, Ill.
National Sheet Metal Co., Peru, Ill.

PLATERS' BRUSHES (See Brushes.)

PLATERS' COMPOUND (See Whale Oil Soap.)

PLATING BARRELS, ROTARY
Lasalco, Inc., St. Louis, Mo.

PLATING AND GALVANIZING BARRELS
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson & Van Winkle Co., Newark, N. J.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York-Chicago.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Vay, John J., Company, Cleveland, Ohio.

PLATING AND GALVANIZING MACHINES, AUTOMATIC (Also see Plating Barrels.)
Hanson & Van Winkle Co., Newark, N. J.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

PLATING, BARREL METHOD, JOB AND CONTRACT (Also see Electroplating.)
Boston Tumble Barrel Plating Works, Boston, Mass.
Brunell, A. A., Company, Worcester, Mass.
Sievering, Philip, New York.

PLATING EQUIPMENT AND SUPPLIES (See Kind Wanted.)

PLATING GENERATORS
Lasalco, Inc., St. Louis, Mo.

PLATINUM (See Smelters and Refiners; Anodes; Bars; Metal Dealers; Sheets; Etc.)

PLATINUM BUFFING CAKE (See Buffing and Polishing Compositions.)

PLATINUM SCRAP (See Metal Dealers.)

PLUMBAGO (See Graphite Products.)

POLISHING ABRASIVES
Abrasive Company, Bridesburg, Philadelphia, Pa.

POLISHING BARRELS (See Burnishing Barrels.)

POLISHING COMPOSITION (See Buffing and Polishing Compositions.)

POLISHING DUST COLLECTING OUTFITS

Small
Leiman Bros., New York.

POLISHING EQUIPMENT AND SUPPLIES (See also Kinds Wanted.)

POLISHING FELTS
American Felt Co., Boston, Mass.
Bacon Felt Co., Winchester, Mass.
Eastern Felt Co., Winchester, Mass.

POLISHING HOODS (See Dust Collectors and Ventilating Systems; Hoods.)

POLISHING LATHES AND HEADS
Bennett-O'Connell Co., Chicago, Ill.
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Cleveland Armature Wks., Cleveland, Ohio.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Enger Electric Co., Watertown, N. Y.
Excelsior Tool & Machine Co., E. St. Louis, Ill.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Mitchell Engineering Co., Springfield, Ohio.
Munning, A. P., & Co., New York-Chicago.

POLISHING LEATHER
Yorkville Mfg. Co., Brooklyn, N. Y.

POLISHING MACHINES (Also see Polishing Lathes and Heads.)

Automatic
Excelsior Tool & Machine Co., E. St. Louis, Ill.

POLISHING AND BURNISHING; JOB AND CONTRACT (See also Electro Plating.)
Brunell, A. A., Company, Worcester, Mass.
Individual Service Co., Easton, Pa.
Sievering, Philip, New York.

POLISHING AND GRINDING ENGINEERS (See Engineers.)

POLISHING WHEELS (See Buffing and Polishing Wheels.)

POLYSULPHIDE
Roessler & Hasslacher Chemical Co., New York.

POTASH

First Sorts
International Chemical Co., Philadelphia, Pa.

Real
International Chemical Co., Philadelphia, Pa.

POTASSIUM CYANIDE
Hardy, Charles, & Ruperti, Inc., New York.
Roessler & Hasslacher Chemical Co., New York.

POWDERED METALS

Aluminum
Kemp, W. H., Co., New York.

Bronze
Du Pont, E. I., de Nemours & Co., Wilmington, Del.

POWDERED COAL BURNERS (See Burners.)

POWER PRESSES
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

PRESSES (Also see Scrap Baling Machine.)

Bench and Foot
Baird Machine Co., Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.

Hydraulic
Watson-Stillman Co., New York.

Power, all Types
Baird Machine Co., Bridgeport, Conn.
Mackintosh-Hemphill Co., Pittsburgh, Pa.

PRESSES, DROP LIFTERS FOR
Miner & Peck Mfg. Co., Derby, Conn.

PRESSURE BLOWERS (See Blowers and Blow-Piping.)

PYROMETERS
Taylor Instrument Companies, Rochester, N. Y.
Thwing Instrument Co., Philadelphia, Pa.

RARE METALS (See Metal Dealers.)

RECLAIMING MACHINERY, METAL (Also see Concentrating Tables; Crushers and Pulverizers; Magnetic Separators.)
Paxson, J. W., Co., Philadelphia, Pa.
Standard Equipment Co., New Haven, Conn.

RECORDING INSTRUMENTS
Thwing Instrument Co., Philadelphia, Pa.

RECORDING THERMOMETERS (See Thermometers.)

REFINERS AND SMELTERS (See Smelters and Refiners.)

RETORTS, GRAPHITE
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.

RHEOSTATS (See also Electrical Apparatus and Equipment.)
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.

RIDDLES (See Foundry Riddles.)

RIVET MAKING MACHINERY
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

RIVETS, NAILS & TACKS, ALL METALS
Hassall, John, Inc., Brooklyn, N. Y.

RODS, PISTON, TOBIN BRONZE
American Brass Co., Waterbury, Conn.

RODS AND BARS (Also see Brass Mill Products.)

Aluminum
British Aluminum Co., Ltd., New York-Toronto, Can.
Strabs Aluminum Co., New York.

Brass, Bronze and Copper
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Standard Underground Cable Co., Pittsburgh, Pa.

ROLLING MILL MACHINERY (See also Draw Benches; Hydraulic Machinery; Presses; Rolls; Shears; Slitters.)
Blake & Johnson Company, Waterbury, Conn.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

ROLLS

Chilled and Sand Iron
Mackintosh-Hemphill Co., Pittsburgh, Pa.

Jewelers'
Leiman Bros., New York.
Mackintosh-Hemphill Co., Pittsburgh, Pa.

ROLLS AND COILS (See Sheets and Strip Metal.)

Brass, Copper and Bronze
Scovill Mfg. Co., Waterbury, Conn.

ROUGE (See also Buffing and Polishing Compositions.)

RUST PREVENTATIVES
International Chemical Co., Philadelphia, Pa.
New Haven Sherardizing Co., Hartford, Conn.
Oakley Chemical Co., New York.
Parker Rust Proof Co., Detroit, Mich.

RUST PROOFING PROCESS
New Haven Sherardizing Co., Hartford, Conn.
Parker Rust Proof Co., Detroit, Mich.

SAND

Molding
Paxson, J. W., Co., Philadelphia, Pa.
Pettinos, George F., Philadelphia, Pa.

For Sand Blasting
Standard Equipment Company, New Haven, Conn.

SAND BLASTS

Accessories and Supplies
Standard Equipment Company, New Haven, Conn.

Barrel
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corporation, Hagerstown, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Standard Equipment Company, New Haven, Conn.

Cabinet
Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Leiman Bros., New York.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Blast Systems
American Foundry Equipment Co., New York.
New Haven Sand Blast Co., New Haven, Conn.
Standard Equipment Company, New Haven, Conn.

SAND BLASTS AND EQUIPMENT
American Foundry Equipment Co., New York.
Pangborn Corporation, Hagerstown, Md.

SAND MIXERS
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equipment Co., Akron, Ohio.

SAND SIFTERS
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equipment Co., Akron, Ohio.

SASH, STEEL
Lupton's, David, Sons Co., Philadelphia, Pa.

SAWDUST

Hard and Soft
National Sawdust Co., Brooklyn, N. Y.

Dustless for Drying Out Metal Goods
National Sawdust Co., Brooklyn, N. Y.

SAWDUST DRYING-OUT BOXES (Also see Drying-Out Machines.)
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
Smith-Richardson Co., Attleboro, Mass.

SAWDUSTLESS METAL DRYERS
Tolhurst Machine Co., Troy, N. Y.

SCRAP METAL DEALERS (See Drosses, Residues, Etc., Buyers of; Turnings, Chips, Etc., Buyers of; Metal Dealers.)

SCREW MACHINE PRODUCTS (Also see Machine Products.)
Economy Machine Products Co., Chicago, Ill.

SEPARATORS, MAGNETIC (See also Magnetic Separators.)
Magnetic Mfg. Co., Milwaukee, Wis.

SHEARS (See Slitters.)

SHEEPSKIN POLISHING WHEELS
Bruce Products Corp., Detroit, Mich.
Yorkville Mfg. Co., Brooklyn, N. Y.

SHEET FELT
American Felt Co., Boston, Mass.
Bacon Felt Co., Winchester, Mass.
Eastern Felt Co., Winchester, Mass.

SHEET METAL PIPING FOR ALL PURPOSES
Cleveland Blow Pipe & Mfg. Co., Cleveland, Ohio.
No-Dust Drying Machine Co., Providence, R. I.

SHEETS (Also see Brass Mill Products; Strip Metal.)

Aluminum
British Aluminum Co., Ltd., New York-Toronto, Canada.
Kemp, W. H., Co., New York.
Strahs Aluminum Co., New York.

Brass, Copper and Bronze
Scovill Mfg. Co., Waterbury, Conn.

Brass, Copper and Nickel Silver
American Brass Co., Waterbury, Conn.
Bristol Brass Co., Bristol, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Dallas Brass & Copper Co., Chicago, Ill.
Manhattan Brass Co., New York.
Metal Purchasing Co., New York.
New England Brass Co., Taunton, Mass.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Western Cartridge Co., East Alton, Ill.

Bronze
Conklin, T. E., Brass & Copper Co., New York.
New England Brass Co., Taunton, Mass.
Rome Brass & Copper Co., Rome, N. Y.

Copper
Conklin, T. E., Brass & Copper Co., New York.
Hussey, C. G., & Co., Pittsburgh, Pa.
National Brass & Copper Co., Lisbon, Ohio.
Rome Brass & Copper Co., Rome, N. Y.

Muntz's Metal
Taunton-New Bedford Copper Co., Taunton, Mass.

Nickel-Silver
Dueber Watch Case Mfg. Co., Canton, Ohio.
New England Brass Co., Taunton, Mass.
Seymour Mfg. Co., Seymour, Conn.

Plated and Polished
American Nickeloid Co., Peru, Ill.
National Sheet Metal Co., Peru, Ill.

Platinum
Roessler & Hasslacher Chemical Co., New York.

Silver, Sterling
Handy & Harman, New York.
Jackson, John J., Co., Newark, N. J.

Zinc
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
New Jersey Zinc Co., New York.

SHELVING STEEL
Lupton's, David, Sons Co. Philadelphia, Pa.

SHERARDIZING
New Haven Sherardizing Co., Hartford, Conn.

SHERARDIZING FURNACES AND EQUIPMENT
New Haven Sherardizing Co., Hartford, Conn.

SILICON COPPER
Ajax Metal Company, Philadelphia, Pa.
Electric Smelting & Aluminum Co., Lockport, N. Y.

Boronic
American Boron Products Co., Reading, Pa.

SILVER (See Smelters and Refiners; Anodes Bars; Castings; Ingots; Metal Dealers; Sheets; Solder; Etc.)

SILVER, BORONIC
American Boron Products Co., Reading, Pa.

SILVER CYANIDE
Roessler & Hasslacher Chemical Co., New York.

SILVERSMITHS' BRUSHES (See Brushes.)

SLAB ZINC
Hegeler Zinc Co., Danville, Ill.
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
New Jersey Zinc Co., New York.

SLAG CRUSHERS (See Crushers and Pulverizers.)

SLITTERS, SHEET METAL (See Shears.)

SLITTING MACHINES
Blake & Johnson Company, Waterbury, Conn.

SMELTERS AND REFINERS (Also see Ingots.)

Copper-Bearing Material
Ajax Metal Company, Philadelphia, Pa.
Capper, Pass & Son, Ltd., Bristol, England.
Whipple & Choate Company, Bridgeport, Conn.

Gold
Handy & Harman, New York.

Platinum
Roessler & Hasslacher Chemical Co., New York.

Silver
Handy & Harman, New York.

White Metals
Michigan Smelting & Refining Co., Detroit, Mich.

Zinc
New Jersey Zinc Co., New York.

SOAP AND SOAP CHIPS
American Tripoli Co., Seneca, Mo.
Greasalt Products Corp., New York.
International Chemical Co., Philadelphia, Pa.
Oakley Chemical Co., New York.

SODA ASH
Roessler & Hasslacher Chemical Co., New York.
Solvay Process Co., Syracuse, N. Y.

SODIUM CYANIDE
American Cyanamid Co., New York.
Cooper, Chas. & Co., New York.
Hardy, Charles, & Ruperti, Inc., New York.
Kyle, Geo. W., Company, New York.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Roessler & Hasslacher Chemical Co., New York.

SOLDER

Tinners
Michigan Smelting & Refining Co., Detroit, Mich.
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y.

Wire or Bar
Lukens, Thos. F., Metal Co., Philadelphia, Pa.

SOLDER MOLDS (See Molds.)

SOLDERING FLUX (See Fluxes.)

SOLDERING, ZINC
New Jersey Zinc Co., New York.

SOLUTIONS, OXIDIZING
Buchanan, C. G., Chemical Co., Cincinnati, Ohio.
Sulphur Products Co., Greensburg, Pa.

SOLVENTS
Celluloid Zapon Co., New York.
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., New York.
Zeller Lacquer Mfg. Co., New York.

SPECIALTIES, METAL (See Wire Specialties; Wire Shapers and Forms; Metal Goods Made to Order.)

SPELTER (See Slab Zinc; also see Ingots.)

SPELTER SOLDER (See Solder Brazing.)

SPINNING CHUCKS (See Chucks.)

SPINNING LATHES (See also Lathes.)
Fruin, Thomas, Machine Co., New York.
Pryibil, P., Machine Co., New York.

SPRAYERS

Foundry
De Vilbiss Mfg. Co., Toledo, Ohio.

Lacquer, Enamel, Japan, Paint
Economy Machine Products Co., Chicago, Ill.
Eureka Pneumatic Spray Co., Richmond Hill, N. Y.
Ideal Air Brush Mfg. Co., New York.

SPRAYING ACCESSORIES, HOODS, TABLES, ETC.
De Vilbiss Mfg. Co., Toledo, Ohio.
Ideal Air Brush Mfg. Co., New York.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

SPRAYING EQUIPMENT, PORTABLE
De Vilbiss Mfg. Co., Toledo, Ohio.
Ideal Air Brush Mfg. Co., New York.

SPRUE CUTTERS (See also Saws.)
Shuster, F. B., New Haven, Conn.
Turner Machine Co., Philadelphia, Pa.

STAMPING AND DRAWING, JOB AND CONTRACT (Also see Metal Goods Made to Order.)
Bridgeport Brass Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, Ohio.
Kenworthy, Charles F., Inc., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Western Cartridge Co., East Alton, Ill.

STEAM SUPERHEATERS
Babcock & Wilcox Co., New York.

STEEL BALLS FOR BURNISHING BARRELS
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
No-Dust Drying Machine Co., Providence, R. I.
Smith-Richardson Co., Attleboro, Mass.

STEEL, BORONIC
American Boron Products Co., Reading, Pa.

STIRRERS (See Graphic Products.)

STOKERS, CHAIN GRATE
Babcock & Wilcox Co., New York.

STONEWARE, ACID-PROOF (See Acid Pumps; Dipping Baskets.)

STRAIGHTENING, CUTTING AND FORMING MACHINERY (See Cutting, Straightening and Forming Machinery.)

STRIP METAL IN COILS AND ROLLS (Also see Brass Mill Products.)

Brass, Copper and Nickel Silver
New England Brass Co., Taunton, Mass.

Copper
National Brass & Copper Co., Lisbon, Ohio.

Zinc
New Jersey Zinc Co., New York.

SULPHATE OF ALUMINUM
Roessler & Hasslacher Chemical Co., New York.

SULPHATE COPPER (Blue Vitriol)
Wiarda, John C., & Co., Brooklyn, N. Y.

SULPHOCYANIDE OF SODA
Roessler & Hasslacher Chemical Co., New York.

SURFACE GRINDING AND POLISHING MACHINE, AUTOMATIC
Excelsior Tool & Machine Co., E. St. Louis, Ill.

SWEEP SMELTERS (See Smelters and Refiners.)

SWING GRINDERS
Excelsior Tool & Machine Co., E. St. Louis, Ill.

SWITCHBOARDS (See also Electrical Apparatus and Equipment.)

SYPHON VENTILATING CABINET
Grand Rapids Blow Pipe & Dust Arrester Co., Grand Rapids, Mich.

TANKS

Lead Lined
Abernethy, John F., Brooklyn, N. Y.

Steel
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Wood
Atlantic Tank & Barrel Corp., Hoboken, N. J.
Corcoran, A. J., & Co., Jersey City, N. J.
Hanson & Van Winkle Co., Newark, N. J.
Kalamazoo Tank and Silo Co., Kalamazoo, Mich.
Munning, A. P., & Co., New York-Chicago.
Stearns, A. T., Lumber Co., Boston, Mass.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

TESTING APPARATUS (See Calipers, Indicating; Pyrometers; Scleroscopes; Thermometers.)

TESTING LABORATORIES (See also Assayers and Chemists.)

Chemical
New York Testing Laboratories, New York.
Norton Laboratories, Lockport, N. Y.
Pitkin, Lucius, Inc., New York.

THERMOMETERS
Taylor Instrument Companies, Rochester, N. Y.

THREAD ROLLING MACHINES
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

TIN; PIG, BAR and BLOCK (See also Ingots, Tin.)

TINNING (See Electro-Plating, Hot Galvanizing and Tinning.)

TINNING FURNACES (See Galvanizing and Tinning Furnaces.)

TINNING FLUXES (See Fluxes.)

TOOL HARDENING FURNACES (See Heat Treating Furnaces.)

TRIPOLI, LUMP AND GROUND
American Tripoli Co., Seneca, Mo.
Krigner Tripoli Co., Detroit, Mich.

TROLLEYS (See Overhead Trolley Systems.)

TUBES (Also see Brass Mill Products.)

Brass, Bronze and Copper
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Standard Underground Cable Co., Pittsburgh, Pa.

Brass and Copper, Small Sizes
Rome Hollow Wire & Tube Co., Rome, N. Y.

Condenser
Scovill Mfg. Co., Waterbury, Conn.

TUMBLING BARRELS (Also see Burnishing and Polishing Barrels; Plating Barrels.)

All Kinds
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, Ohio.
Henderson Bros. Co., Waterbury, Conn.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.

Foundry
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, Ohio.
Henderson Bros. Co., Waterbury, Conn.
Wadsworth Core Machine & Equipment Co., Akron, Ohio.

Japanning
Baird Machine Co., Bridgeport, Conn.

Lacquering
Baird Machine Co., Bridgeport, Conn.

Oblique
Baird Machine Co., Bridgeport, Conn.
Henderson Bros. Co., Waterbury, Conn.

TUNGSTEN
Metal & Thermit Corp., New York.

TURNINGS, CHIPS, ETC., BUYERS OF (Also see Drosses, Residues, Etc., Buyers of; Metal Dealers.)

TYPE METAL (See Ingots.)

VACUUM PUMPS, ROTARY
Leiman Bros., New York.

VARNISHES FOR ALL PURPOSES
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Hilo Varnish Corp., Brooklyn, N. Y.

VENTILATING SYSTEMS (See Blowers and Blow Piping; Dust Collectors and Ventilating Systems; Exhaust Fans and Heads.)

VIBRATORS
Campbell-Hausfeld Co., Harrison, Ohio.

VIENNA LIME COMPOSITIONS (See Buffing and Polishing Compositions.)

VOLTMETERS (Also see Electrical Apparatus and Equipment.)
Connecticut Dynamo & Motor Co., Irvington, N. J.

WASHING MACHINE, METAL PARTS
Crescent Washing Machine Co., New Rochelle, N. Y.
No-Dust Drying Machine Co., Providence, R. I.

WASTE CLEANER AND OIL RECLAIMER
Greasalt Products Corp., New York.
International Chemical Co., Philadelphia, Pa.
Oakley Chemical Co., New York.

WEIGHERS AND SAMPLERS
New York Testing Laboratories, New York.
Pitkin, Lucius, Inc., New York.

WHALE OIL SOAP (Also see Cleaning Compounds; Fig Cleansers.)
International Chemical Co., Philadelphia, Pa.

WHITE METALS (See also Smelters and Refiners; Babbitt Metal; Ingots; Etc.)
Ajax Metal Company, Philadelphia, Pa.

WILFLEY TABLES
Mine & Smelter Supply Co., New York.

WIRE

Aluminum
British Aluminum Co., Ltd., New York-Toronto, Canada.

Brass, Bronze, Copper and Nickel-Silver, Etc.
American Brass Co., Waterbury, Conn.
Conklin, T. E., Brass & Copper Co., New York.
Gilby Wire Co., Newark, N. J.

Fine Sizes
Gilby Wire Co., Newark, N. J.

WIRE DIAMOND DIES
Vianney Wire Die Wks., New York.

WIRE DRAWING GREASES
United States Wire Draw Grease Co., Elizabeth, N. J.

WIRE DRAWING MACHINES
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

WIRE FORMING MACHINERY (See also Cutting, Straightening and Forming Machinery.)
Baird Machine Co., Bridgeport, Conn.

WIRE MILL PRODUCTS (See Brass Mill Products; Wire.)

WIRE SOLDER MAKING MACHINES
Lukens, Thos. F., Metal Co., Philadelphia, Pa.

WIRE STRAIGHTENING AND CUTTING MACHINERY (See Cutting, Straightening and Forming Machinery.)

WIRE WHEEL BRUSHES (See Brushes.)

WIRING DEVICES (See Electrical Apparatus and Equipment.)

WOOD ENAMELS (See Enamels.)

WOOD LACQUERS (See Lacquers.)

WOODFILLERS, PASTE
Du Pont, E. I., de Nemours & Co., Wilmington, Del.
Hilo Varnish Corp., Brooklyn, N. Y.

YELLOW BRASS (See Sheets, Munts's Metal.)

ZINC (See Slab Zinc; Smelters and Refiners; Anodes; Sheets; Strip Metal; Etc.)

ZINC CYANIDE
American Cyanamid Co., New York.
Hardy, Charles, & Ruperti, Inc., New York.
Roessler & Hasslacher Chemical Co., New York.

ZINC DUST
New Jersey Zinc Co., New York.

ZINC ELECTROLYTIC
United Metals Selling Co., New York.

ZINC PLATING (See Electro-Galvanizing.)

ZINC PRODUCTS
New Jersey Zinc Co., New York.

ZINC, ROLLED (Also see Sheets, Zinc.)
New Jersey Zinc Co., New York.
Platt Bros. & Co., Waterbury, Conn.

ZINC SULPHATE, TECHNICAL AND ANHYDROUS
Hardy, Charles, & Ruperti, Inc., New York.

ZINC SALTS, COMMERCIAL
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

ALPHABETICAL INDEX OF ADVERTISEMENTS

A

Page

Abbott Ball Co., Hartford, Conn. 22
Abernethy, John F., Brooklyn, N. Y. 24
Abrasive Co., Bridesburg, Philadelphia, Pa..... 22
Ajax Metal Co., Philadelphia, Pa. 80
Amalgamated Metals Selling Co., Ltd., New York 14
American Boron Products Co., Reading, Pa.... 6
American Brass Co., Waterbury, Conn. 58
American Cyanamid Co., New York 49
American Felt Co., Boston, Mass. 27
American Foundry Equipment Co., New York.. 15
American Nickeloid Co., Peru, Ill. 59
American Tripoli Co., Seneca, Mo. 13
Anaconda Copper Mining Co., New York 66
Anthony, H. M., Co., New York 32
Armstrong Cork & Insulation Co., Pittsburgh, Pa. 7
Astie, H. J., & Co., Providence, R. I. 22
Atlantic Tank & Barrel Corporation, Hoboken, N. J. 24

B

Babcock & Wilcox Co., New York 21
Bacon Felt Co., Winchester, Mass. 38
Baird Machine Co., Bridgeport, Conn. 31
Balbach Smelting & Refining Co., New York.. 65
Baltimore Brass Co., Baltimore, Md. 64
Bartley, Jonathan, Crucible Co., Trenton, N. J. 11
Belmont Smelting & Refining Works, Brooklyn, N. Y. 65
Bennett-O'Connell Co., Chicago, Ill. 30
Best, W. N., Corp., New York 12
Bias Buff & Wheel Co., Jersey City, N. J. 1
Blake & Johnson Company, Waterbury, Conn... 21
Blumenthal, H., & Co., New York 19
Boston Tumble Barrel Plating Works, Boston, Mass. 26
Bridgeport Brass Co., Bridgeport, Conn. 63
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn. 28
Bristol Brass Co., Bristol, Conn. 63
British Aluminum Co., Ltd., New York-Toronto, Can. 61
Bruce Products Corp., Detroit, Mich. 35
Brunell, A. A., Co., Worcester, Mass. 26
Buchanan, C. G., Chemical Co., Cincinnati, Ohio 22
Buchanan, Thos., Co., Cincinnati, Ohio..... 29
Buckeye Products Co., Cincinnati, Ohio 8
Burns, E. Reed, Mfg. Corp., Brooklyn, N. Y... 27
Byrd, R. E., Erie Pa. 16

C

Campbell-Hausfeld Co. Harrison, Ohio 9
Capper Pass & Son, Ltd., Bristol, England.... 64
Celluloid Zapon Co., New York 52
Cleveland Armature Works, Cleveland, Ohio ... 23
Cleveland Blow Pipe & Mfg. Co., Cleveland, O. 17
Conklin, T. E., Brass & Copper Co., New York 58
Connecticut Brass Foundry Co., Waterbury, Conn. 30
Connecticut Dynamo & Motor Co., Irvington, N. J. 23
Cooper, Charles & Co., New York 27
Copper & Brass Research Association, New York 57
Corcoran, A. J., Inc., Jersey City, N. J. 24
Cowles Detergent Co., Lockport, N. Y. 34
Crescent Washing Machine Co., New Rochelle, N. Y. 33
Crown Rheostat & Supply Co., Chicago, Ill.... 44

D

Dallas Brass & Copper Co., Chicago, Ill. 63
De Vilbiss Mfg. Co., Toledo, O. 48
Detroit Electric Furnace Co., Detroit, Mich..... 4
Divine Bros. Co., Utica, N. Y. 36
Dixon, Jos., Crucible Co., Jersey City, N. J..... 9
Dueber Watch Case Co., Canton, Ohio 63
Du Pont, E. I., de Nemours & Co., Wilmington, Del. 50

E

Eager Electric Co., Watertown, N. Y. 20
Eastern Felt Co., Winchester, Mass. 39
Economy Machine Products Co., Chicago, Ill.... 48
Egyptian Lacquer Mfg. Co., New York 2
Electric Smelting & Aluminum Co., Lockport, N. Y. 62
Eureka Pneumatic Spray Co., Richmond Hill, N. Y. 46
Excelsior Tool & Machine Co., East St. Louis, Ill. 20

F

Fanning, J. P., Co., Brooklyn, N. Y. 16
Ford, J. B., Co., Wyandotte, Mich. 32
Fruin, Thomas, Machine Co., New York 19
Fuller, W. A., Company, Greensburg, Pa. 28

G

Page

Gautier, J. H., Co., Jersey City, N. J. 10
General Abrasive Co., Niagara Falls, N. Y. 22
General Ceramics Co., New York 26
General Chemical Co., Philadelphia, Pa. 16
Gilby Wire Co., Newark, N. J. 64
Globe Machine & Stamping Co., Cleveland, O. .. 26
Grand Rapids Blow Pipe & Dust Arrestor Co., Grand Rapids, Mich. 17
Greasalt Products Co., New York 34

H

Handy & Harman, New York 53
Hanson & Van Winkle Co., Newark, N. J. 45
Hardy, Chas., & Ruperti, New York 81
Harshaw, Fuller & Goodwin Co., Cleveland, O... 29
Hassall, John, Inc., Brooklyn, N. Y. 61
Hawley Down Draft Furnace Co., Easton, Pa. 8
Hegeler Zinc Co., Danville, Ill. 66
Henderson Bros. Co., Waterbury, Conn. 25
Hendricks Bros., New York 64
Hilo Varnish Corp., Brooklyn, N. Y. 47
Hussey, C. G., & Co., Pittsburgh, Pa. 64

I

Ideal Air Brush Co., New York 48
Illinois Zinc Co., Peru, Ill. 65
Individual Service Co., Inc., Easton, Pa..... 66
International Chemical Co., Philadelphia, Pa... 82

J

Jackson Co., John J., Newark, N. J. 63
Jantz & Leist Electric Co., Cincinnati, O. 23
Johnson Gas Appliance Co., Cedar Rapids, Iowa 5
Johnson Mfg. Co., Chicago, Ill. 18

K

Kalamazoo Tank & Silo Co., Kalamazoo, Mich. 24
Kay & Ess Co., Dayton, Ohio 48
Kemp, W. H., Co., New York 61
Kenworthy, Chas. F., Inc., Waterbury, Conn. .. 8
Keystone Refractories Co., New York 11
Kirk & Blum Mfg. Co., Cincinnati, O. 17
Krigner Tripoli Co., Detroit, Mich. 36
Kyle, George W., & Co., Inc., New York 27

L

Lassaigo, Inc., St. Louis, Mo. 54
Lava Crucible Co. of Pittsburgh, Pittsburgh, Pa. 13
Leavitt, C. W., & Co., New York 65
Lehman Bros., Hoboken, N. J. 59
Lehman Bros., New York 16
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill. 46
Light Mfg. & Foundry Co., Pottstown, Pa..... 60
Lukens, Thos. P., Metal Co., Philadelphia, Pa.. 60
Lupton's, David, Sons Co., Philadelphia, Pa... 9

M

Maas & Waldstein Co., New York 49
Mack Engineering and Supply Co., Inc., New York 12
Mackintosh-Hemphill Co., Pittsburgh, Pa. 21
Magnetic Mfg. Company, Milwaukee, Wis. ... 17
Magnus Chemical Co., Brooklyn, N. Y. 33
Manhattan Brass Co., New York 63
Matchless Metal Polish Co., Chicago and Glen Ridge, N. J. 38
Matthiessen & Hegeler Zinc Co., La Salle, Ill. 67
McCullough-Dalzell Crucible Co., Pittsburgh, Pa. 10
Metal & Thermit Corp., New York 60
Metal Purchasing Co., New York 65
Michigan Smelting & Refining Co., Detroit, Mich. 60
Mine & Smelter Supply Co., New York 12
Miner & Peck Mfg. Co., Derby, Conn. 19
Mitchell Engineering Co., Springfield, O. 22
Monarch Engineering & Mfg. Co., Baltimore, Md. 3
Munning, A. P., & Co., New York-Chicago..... 43

N

Nassau Smelting & Rfg. Works, New York..... 63
National Brass & Copper Co., Lisbon, Ohio ... 63
National Engineering Co., Chicago, Ill. 14
National Sawdust Co., Brooklyn, N. Y. 28
National Sheet Metal Co., Peru, Ill. 66
Naugatuck Valley Crucible Co., Shelton, Conn. 81
New England Brass Co., Taunton, Mass. 60
New Haven Sand Blast Co., New Haven, Conn. 14
New Haven Sherardizing Co., Hartford, Conn.. 80

Page

New Jersey Zinc Co., New York 55
New York Testing Laboratories, New York.... 62
Niagara Falls Smelting & Refining Corp., Buffalo, N. Y. 61
Nikolas, G. J., & Co., Chicago, Ill. 51
No-Dust Drying Machine Co., Providence, R. I. 25
Northern Engineering Works, Detroit, Mich. .. 12
Norton Laboratories, Inc., Lockport, N. Y. ... 14

O

Onkley Chemical Co., New York 33
Oden Corp., Whitestone, L. I., N. Y. 32

P

Pangborn Corporation, Hagerstown, Md. 17
Parker Rust-Proof Co., Detroit, Mich..... 47
Paxson, J. W., Co., Philadelphia, Pa. 15
Pettinos, George F., Philadelphia, Pa. 13
Pitkin, Lucius, Inc., New York..... 62
Platt Bros & Co., The, Waterbury, Conn. 65
Pryibil, P., Machine Co., New York 18

Q

Quigley Furnace Specialties Co., Inc., New York 11

R

Radnal, Josef, New York 64
Rockwell, W. S., Co., New York 11
Roessler & Hasslacher Chemical Co., New York 40
Rome Brass & Copper Company, Rome, N. Y.. 61
Rome Hollow Wire & Tube Co., Rome, N. Y... 63
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa. 12

S

Schehr, Geo. A., Cincinnati, O..... 66
Schweizer, Chas. K., St. Louis, Mo. 16
Scovill Mfg. Co., Waterbury, Conn. 56
Seidel, R. B., Inc., Philadelphia, Pa. 10
Seymour Mfg. Co., Seymour, Conn. 59
Shuster, F. B., Co., New Haven, Conn. 21
Sievering, Philip, New York 26
Smith-Richardson Co., Attleboro, Mass. 24
Solvay Process Co., Syracuse, N. Y. 32
Standard Equipment Co., New Haven, Conn.... 15
Standard Rolling Mills, Inc., Brooklyn, N. Y.. 64
Standard Underground Cable Co., Pittsburgh, Pa. 63
Steiner, E., & Co., Newark, N. J. 19
Stevens, Frederic B., Detroit, Mich. 42
Straha Aluminum Co., New York 62
Sulphur Products Co., Greensburg, Pa. 28
Superior Chemical & Mfg. Co., Aspinwall, Pa.. 18
Surface Combustion Co., New York 12

T

Taunton-New Bedford Copper Co., New Bedford, Mass. 63
Taylor, Robert J., Inc., Philadelphia, Pa. 10
Taylor Instrument Companies, Rochester, N. Y. 12
Thwing Instrument Co., Philadelphia, Pa. 62
Tolhurst Machine Works, Troy, N. Y. 25
Trotter & Co., Nathan, Philadelphia, Pa. 65
Turner Machine Co., Philadelphia, Pa. 16

U

United Metals Selling Co., New York 60
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y. 41
United States Wire Draw Grease Co., Elizabeth, N. J. 19

V

Vay, John J., Company, Cleveland, Ohio 28
Vianney Wire Die Works, New York 18

W

Wadsworth Core Machine & Equipment Co., Akron, Ohio 14
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. 54
Watson-Stillman Co., New York 18
Waukegan Chemical Co., Waukegan, Ill. 40
Western Cartridge Co., Alton, Ill. 58
Whipple & Choate Co., Bridgeport, Conn. 64
Wiarda, John C., Co., Brooklyn, N. Y..... 27
Wile Electric Furnace & Engineering Co., New York 5

Y

Yorkville Mfg. Co., Brooklyn, N. Y. 37

Z

Zeller Lacquer Manufacturing Company, Inc., New York 53

BUILDERS OF PORTABLE

SHERARDIZING FURNACES

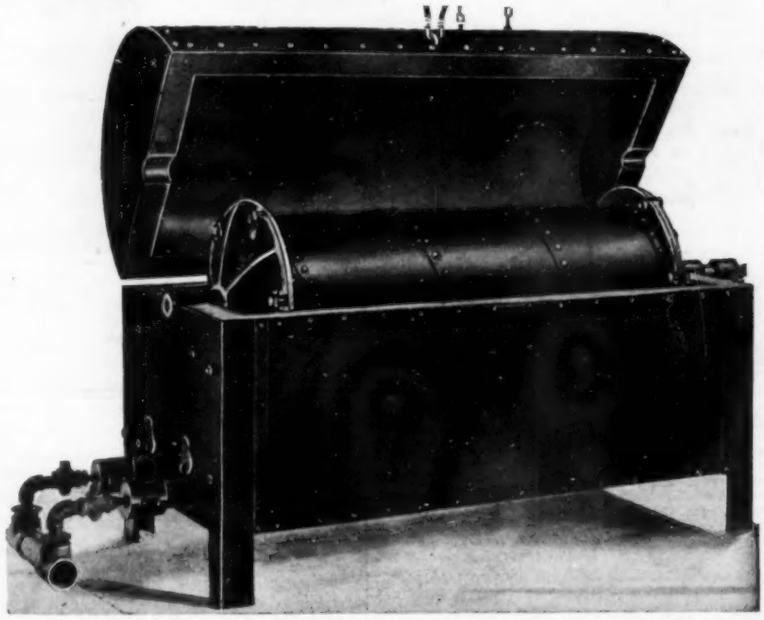
AND EQUIPMENT

CAPACITY ONE TO FORTY TONS

Largest plant in New England used exclusively for Sherardizing.

Let us figure on your rust-proofing problems.

Write for Quotations



THE NEW HAVEN SHERARDIZING CO.

868 Windsor Street,
HARTFORD, CONN.

50/50% NICKEL COPPER

For use in the production of Cupro-Nickel Castings; also in Lead Copper Mixtures.

Also

Pure Tungsten Powder 97% W.	**Pure Chromium 97/98% Cr.**
Tungtabs 97% W.	**95-98% Pure Manganese Metal**
Pure Copper 97/98% Co.	**30/70% Manganese Copper Alloys**

(The Thermit alloys mentioned above are technically carbonfree)

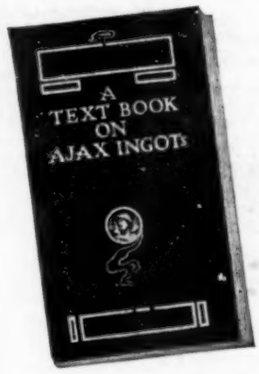
Write for metal Booklet 2058 which contains full information on the subject; also many useful formulas and suggestions.

THERMIT

METAL & THERMIT CORPORATION

120 Broadway, New York

Pittsburgh **Chicago** **Boston** **S. San Francisco** **Toronto**



FREE!

There's a copy for *You!*

This book doesn't attempt to tell you all there is to know about Ingot Metals, but it **does** call your attention to many helpful kinks which have proved of value in other foundries and which may solve some of **your** problems.

It tells you the earmarks of good metal, tells you how to pick the alloy to fit the task, gives some tips on melting practice and extends a helping hand generally.

Write for Booklet M on your business letter head

THE AJAX METAL COMPANY

ESTABLISHED 1880

PHILADELPHIA

NEW YORK **CHICAGO** **BOSTON** **CLEVELAND**

Every Brass Man Knows

that the famous Naugatuck Valley of Connecticut is the world's greatest brass manufacturing district.

Many Brass Foundrymen consider our "Naugatuck Valley" crucibles, developed to meet the exacting conditions found in the great brass foundries and mills of the Valley, the best crucibles in the world.

Have you ever used them? A trial order, then a comparative test in your foundry, might surprise you.

Order a few crucibles and draw your own conclusions from their performance.

Naugatuck Valley Crucible Co. - : - Shelton, Conn.

CHARLES HARDY & RUPERTI, INC.

115 BROAD STREET
NEW YORK

FACTORIES: *ELIZABETHPORT, N. J.* / *BAYWAY, N. J*

MANUFACTURERS OF

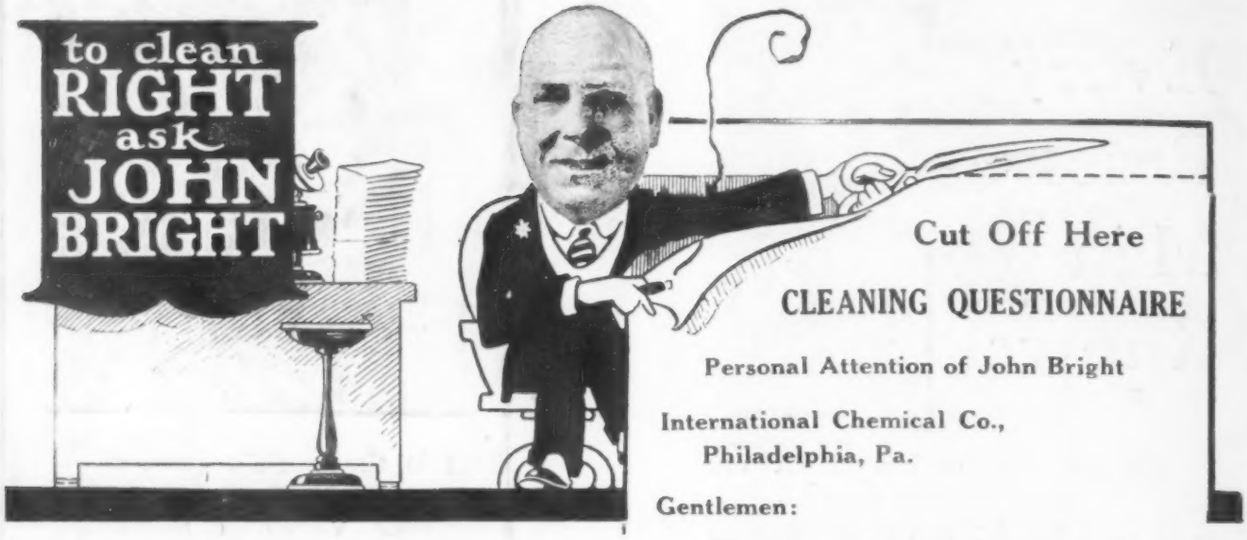
Copper Cyanide 70% — **Zinc Cyanide 55%**
Copper Carbonate 50/52% — **Zinc Sulphate**
Copper Sulphate

Importers of
FRENCH SODIUM CYANIDE:
125/128% Briquettes

Distributors:

Bennett & Seeley, Inc.,	Bridgeport, Conn.	Chas. F. L'Hommedieu Sons & Co.,	Chicago, Ill.
General Supply Co.,	Cleveland, O.	Geo. W. Kyle & Co.,	New York City.
The Buckeye Soda Products Co.,	Cincinnati, O.	Geo. L. Claflin,	Providence, R. I.
E. J. Woodison Co.,	Detroit, Mich.	Lasalco, Inc.,	St. Louis, Mo.
Charles L. Raffi,	Boston, Mass.		

FOR INDEX TO ADVERTISERS, SEE PAGE 79



MANY of you folks really want to cut your cleaning costs and increase the efficiency of your cleaning department, but for some reason you have not gone into the subject deeply enough to find out how easily you can accomplish these results.

Rather than waste a lot of words and use a lot of space, I am devoting half of my page to a questionnaire which, when filled in and mailed to me, will bring you some *real* money saving ideas.

No matter what you are manufacturing, just fill in your half of this page, tear it out, mail it and in return for your trouble I'll recommend one of our forty cleaners that will *exactly* suit your needs. And in addition I may have some valuable suggestions as to method. If you wish I'll ship you a trial lot of material so you can prove to yourself that INTERNATIONAL CLEANERS are *better*, *cheaper* and *quicker* than any others.

That's a broad statement but I'm ready to back it up! Remember, trial costs you nothing unless you are perfectly satisfied.

Internationally yours,
John Bright

Cut Off Here

CLEANING QUESTIONNAIRE

Personal Attention of John Bright

International Chemical Co.,
Philadelphia, Pa.

Gentlemen:

Here's my half of the page. Now that I have filled it out, what can you do for me?

Class of work to be cleaned.....
.....

Subsequent operation to the work.....
.....

Kinds of oil and dirt to be removed.....
.....
.....

Present method.....
.....
.....

Present difficulty if any.....
.....
.....

Remarks .....
.....
.....
.....

Name .....
Company .....
Address .....
.....

International Products
IC
International Chemical Co.
INTERNATIONAL CHEMICAL CO.
PHILADELPHIA ~~~~~ PENNA.